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SOLID WASTE MANAGEMENT, ABSTRACTS FROM THE LITERATURE-1965

John A. Connolly, et al

Environmental Protection Agency
Rockville, Maryland

1972

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SOLID WASTE MANAGEMENT

Abstracts from the Literature — 1965

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JOHN A. CONNOLLY *and* SANDRA E. STAINBACK

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An Environmental Protection Publication

This publication is also in the Public Health Service numbered series as Public Health Service Publication No. 91-1965, Supplement H; its entry in two government publication series is the result of a publishing interface reflecting the transfer of the Federal solid waste management program from the U.S. Public Health Service to the U.S. Environmental Protection Agency.

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THE SOLID WASTE MANAGEMENT BIBLIOGRAPHIC SERIES
1941 – 1971

Since its beginning over a quarter century ago, the Federal program in solid waste management has had a number of organizational aegises, as well as several organizational titles. One constant, though, has been quite visible throughout the program's development, and that is its unflagging interest in bibliography.

Collecting past data on a problem by a literature search is the classic first step used in the scientific method of problem solving. Thus, in 1941, the first workers in the Federal program searched the world-wide literature for information that had been published on solid wastes. The resultant bibliography was then published as a service to other workers in the field and became an annual publication in the Public Health Service series. This step was taken again in 1965, following the passage of the Solid Waste Disposal Act, when the early bibliographies were reprinted and made more widely available. The literature search was then extended through 1971, and the present bibliography is one of those that will bring the series up to date.

--SAMUEL HALE, JR.
Deputy Assistant Administrator
for Solid Waste Management

Gift - 6/15/72

SOLID WASTE MANAGEMENT
Abstracts from the Literature

1965

The Solid Waste Disposal Act of 1965 (Public Law 89-272, Title II) and its amending legislation, the Resource Recovery Act of 1970 (Public Law 91-512, Title I), authorize collection, storage, and retrieval of information relevant to all aspects of solid waste management.

The literature represented in this bibliography does not include all the 1965 solid waste literature published; 58 periodical and 51 nonperiodical titles covering both the foreign and domestic literature were screened for inclusion. No effort was made to separate strictly technical material from that which is more general. The bibliography is arranged in categories corresponding to the various administrative, engineering, and operational phases of solid waste management. Indices include subject, corporate author, and geographical location cited. Addresses of periodical sources are provided.

This project is the result of the combined efforts of the Solid Waste Information Retrieval System (SWIRS) and the Franklin Institute Research Laboratories under contracts PH 86-67-182 and PH 86-68-194. SWIRS was also assisted in this project by 1970 summer-student employees: Cynthia Brooks, Susan Brown, and Martha Renner.

--THOMAS F. WILLIAMS, *Director*
Technical Information Staff
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REGULATIONS (including Laws and Ordinances)

65-0001
Annual report on government patent policy. Washington, U.S. Government Printing Office, June 1965. 13 p.

The Patent Advisory Panel was established to develop common guidelines for implementing the Government Patent Policy, encourage data acquisition by agencies to serve as a basis for policy review, and recommend uses for all patents. The Policy contains two basic principles. It establishes basic criteria to guide decisions as to means of disposing of patent rights and considers full circumstances surrounding individual contracts or inventions. The Panel feels that flexibility should be implicit in any government-wide patent policy, but the Justice Department still has not approved this idea. Although the Policy's effectiveness in encouraging development and utilization of inventions cannot now be measured, steps toward greater unity can be reported. NASA, DOD, and AEC, agencies responsible for approximately 90 percent of total government R&D funds for 1964, have published regulations implementing the President's Policy Statement. The Panel has issued an interpretative statement to relevant agencies, published a Progress Report to inform the public, collected data to measure the agencies' patent practices prior to issuance of the Policy Statement, and suggested that the Secretary of Commerce undertake a limited, experimental program for promoting and protecting government-owned inventions in foreign countries. The Panel is presently engaged in reviewing agencies' implementing regulations, considering recommendations on the licensing of government-owned patents in the United States, and on the application of the Policy Statement to university contractors and grantees. Appendices include the President's memorandum on stating the Government's Patent Policy and giving a list of panel members.

65-0002
Anti-trust fines total $42,000 for Pennsylvania contractors. Refuse Removal Journal, 8(9):26, Sept. 1965.

Appeal was denied the Philadelphia Refuse Removal Association and four of its officers, who were found guilty of violating the Sherman Anti-Trust Act. They received fines totaling $42,500 and suspended prison sentences.

65-0003
ASCE testifies at hearings on solid wastes disposal. Civil Engineering, 35(8):95, Aug. 1965.

The American Society of Chemical Engineers has submitted a statement to the House Subcommittee on Public Health and Welfare endorsing the Solid Waste Disposal Acts' legislation to improve research and working programs in solid waste disposal matters.

65-0004
Aurora moves to halt open burning. Refuse Removal Journal, 8(9):24, Sept. 1965.
In a move to control air pollution, Aurora, Colorado has introduced legislation to prohibit open trash burning and backyard incinerators. A city council study was being made to check into the costs to homeowners who would be required to dispose of their own rubbish. The city's mayor stated that private trash-hauling services in the area charged only $1.75 a month for weekly refuse collection. Presently, Aurora restricts backyard burning hours to between 3 to 5 pm and 8 to 10 pm. The Tri-County District Health Department is attempting to get Denver and the surrounding counties to ratify a model air pollution control code recently endorsed by the five-county Regional Air Pollution Control Agency. Under the code, incineration would be prohibited after January 1, 1968.

65-0005
Aust, A. Waste treatment in today's urban era. Compost Science, 5(3):24-26, Autumn-Winter 1965.

The three basic social developments in the United States are: urbanization, technical advances, and advances in communication. The people are becoming more critical of obnoxious industrial practices, and are more vocal and insistent that corrective measures be taken either voluntarily or by legal means. Legal controls are: (1) planning controls, making use of zoning and land-use control; (2) public health controls, including advances in waste and sewerage disposal, and in air pollution; (3) public safety codes; and (4) aesthetic controls, making the community beautiful, healthy, spacious, clean, and well-balanced. These legal developments are firmly entrenched in the judicial processes with more to come if industry fails to take the lead in voluntary clean up. There are three economic courses of action: (1) the laissez-faire or do-nothing approach; (2) the self-sufficient or self-contained approach; and (3) the cooperative or good citizen approach. The latter approach is the least expensive in the long run, if this were not true there would not be many new plants in urban areas.

65-0006
Better landfill standards, Refuse Removal Journal, 8(11):12, Nov. 1965.

A 'totally planned' sanitation ordinance which includes all community sectors, private and public, is preferable to the current practice of piecemeal legislation designed to correct one flaw at a time. A cooperative effort between industry and municipal officials has provided well planned and executed regulations. This editorial deals mainly with the upkeep of sanitary landfill and a New Jersey ordinance regulating bonding, liability insurance, and fire prevention equipment.

65-0007
British Standard 3440. Public Cleansing, 55(4):188, Apr. 1965.

British Standard no. 3440 is a basic document for everyone involved at the executive level in making, converting, or disposing of paper and board. The standard puts the Council's NEP (not easily pulpable) scheme with amendments on an official footing, and outlines a more practical code dealing with waste paper and salvage.

65-0008
Buffalo mayor indicted in island dump closing. Refuse Removal Journal, 8(9):10, Sept. 1965.

A grand jury indicted the mayor and the former corporation counsel of Buffalo, New York, on charges of conspiring to profit by changing refuse disposal operations. They were accused of closing the city-owned dumps so that the collectors could use another facility, in which the city officials were alleged to have been promised an interest.

65-0009
California bill wants trash bags in cars. Refuse Removal Journal, 8(2):14, Mar. 1965.

The California State Legislature is considering a bill to require every motorist to have a litter bag in his automobile. This is one of three laws introduced by State Senator Ralph Collier as an offensive against highway litterbugs who cost California taxpayers $3 million a year for road cleaning. Another piece of legislation would establish a $500 fine on conviction as a litterbug. The third bill would require a $.10 deposit on all beverage containers in an attempt to make sure they don't end up along state highways.

65-0010
California city makes war on illegal receptacles. Refuse Removal Journal, 8(4):30,38, Apr. 1965.

Merced, California, has an ordinance which enables the City's Disposal Department to condemn improper containers. The ordinance is reprinted.

65-0011
Chappel, W. Pass new anit-litter law. Refuse Removal Journal, 8(4):40, Apr. 1965.

Los Angeles passed an ordinance attempting to clamp down on refuse haulers that litter the streets and highways. Two major provisions are that a city permit be obtained for each truck used in rubbish hauling and that the vehicles have a fully enclosed, metal body with a cover constructed of metal or other solid material.

65-0012
Chappel W. Stolen receptacles cause serious fire and health dangers. Refuse Removal Journal, 8(1):23, 28, 38, Jan. 1965.

Los Angeles County passed an ordinance which attempts to crack down on the 'rustling' of containers. Officials believe that some contractors have removed their competitors' containers, repainted and restenciled them and reissued them among their own customers. The stealth is regarded as a serious health and safety hazard.

65-0013
Court ruling says municipal contract valid without funds. Refuse Removal Journal, 8(2):4, Feb. 1965.

The right of the Township of Saddle Brook, New Jersey, to enter into a refuse collection contract, even though sufficient funds for a full year's payment were not included in the current budget, was upheld in Hackensack (New Jersey) Superior Court. The ruling ended eight months controversy which started when minority members of the Township Council refused to appropriate funds for a new collection contract. According to Judge C. Conrad Schneider, the five-man Council had validly entered into a 5-year contract totaling $360,000 with Vito Stamato, Inc. of Paramus for refuse collection. When the minority members blocked an emergency appropriation of $48,000 for the new contract, there was no refuse collection for 2 weeks. The Council majority reached an agreement with Stamato, although full payment was not made. The minority members then brought legal action to have the contract declared void on the grounds that the method of payment was not in accordance with the published specifications, and that the Council had no right to enter into the contract without the necessary funds at hand.

65-0014
Doose, U. Law and administration. In Refuse and waste disposal. Berlin, Druckhaus Lichterfeld GmbH, 1964.

Legal and administrative regulations covering civil law, sanitation law, industrial law, building law, water law, road law, traffic law, and the Nature Conservation Law are presented. Sanitation law discusses the Federal Epidemic Law and the Cattle Plague Law. Industrial law covers the Factory Act of 21.6 1869/22,12.1959, Order on Licensable Installations According to FA 4.8 1960, Law on Protection against Air Pollution Noises and Vibrations, and Second Ordinance for Implementing the Immission Protection Law. The Federal Building Law of 23.6.1960, the State Building Codes, the Regulations governing installations for solids waste, the Regulations for Waste Chutes, and ARGEBAU Standards for the Construction of Waste Chute and Incineration Installations are discussed under Building Law. The Water Conservation Law of 27.7 1957 and the Water Protection, Administrative Measures on Road Tanker Accidents and Leakage in cases of Mineral Oil are presented.

65-0015
An editorial. Refuse Removal Journal, 8(2):14, Feb. 1965.

A national plumbers association is campaigning to promote the enactment of a city ordinance requiring the use of food waste disposal units in all new homes. Such units would be disadvantageous overall because they would be a boon to rat colonies and would augment the water pollution problem.

65-0016
Filled in land is ruled a deduction by tax court. Refuse Removal Journal, 8(6):10, June 1965.

The United States Tax Court has ruled that John J. Sexton, a landfill owner in the Chicago area, may take deductions on his income tax for depreciation of land specifically purchased for use in his dump operation. The allowance is based upon the quantity of space exhausted by filling in each year of business. The history of excerpts from the Tax Court's ruling are presented.

65-0017
Forty million dollar Senate waste bill would grant sums for research. Refuse Removal Journal, 8(7):20, July 1965.

The U.S. Senate has passed a 2-year $40-million bill that would amend the Clean Air Act and set up a Solid Waste Disposal Act. Under the bill, the Department of Health, Education, and Welfare would conduct, encourage, assist, and finance projects on solid waste disposal.

65-0018
Garner, J. F. Discussion of 'The law and public cleansing'. Public Cleansing, 55(8):469-473, Aug. 1965.

Answers to legal questions posed after the above talk regarding collection sites, material which should be collected, definition of household refuse, and other questions on refuse collection associated with British law are discussed. Lack of laws committing municipal governments to fully hygienic and satisfactory service was noted. Salvage days on premises are considered.

65-0019
Hope, M. C. Solid waste legislation. Journal of Environmental Health, 28(2):123-126, Sept.-Oct. 1965.

The recent federal legislation in the disposal of solid wastes is discussed. As various national organizations emphasized, proper solid waste disposal is vital to public health and to environmental beauty. Upon the President's recommendation for legislation, the Administration drafted a bill to assist states, communities, and industries in prevention and control of solid waste problems at a $10 million level for the first year. The bill encouraged interstate and interlocal cooperation, and made grants to state and interstate agencies not to exceed 50 percent of the survey costs of disposal practices and plans. Also included was authorization for a national program of research and demonstration projects. The Secretary of Health, Education, and Welfare was designated to administer the act. Secondly, a new S.306, Title II bill was proposed, similar to the Administration bill, although somewhat more restrictive. It authorized the following grants-in-aid: for research, up to 25 percent of the total amount appropriated for any fiscal year; for demonstration projects, up to 2/3 of the cost, under specified provisions; for surveys, up to 2/3 of the cost. Appropriations authorized for fiscal years 1966 and 1967 were $20 million per year to remain available until expended. Finally, the House proposed H.R. 890, also similar in purpose to the preceding two bills, with particular emphasis on facilitating advanced types of processes or practices. In addition it authorizes grants to states at a level of $2 million for 4 years for development of state programs. This act would be administered by the Surgeon General.

65-0020
The law and public cleansing. Surveyor and Municipal Engineer, 125(3812):35b-36, June 26, 1965.

A discussion of a paper given by Professor Garner, concerned with legal definitions of the various types of refuse which have to be collected by the local authorities and the conditions under which refuse has to be collected, is reviewed. The law covering the work of a public cleansing department is largely permissive and describes the refuse and materials which have to be collected stressing the point that trade wastes are recognized by their nature and not by the premises from which they arise. Some fine legal distinctions were made in that a caravan is not a premise, but the site upon which the caravans stand is considered a premise. A paper sack may be considered to be a dust bin, but not the sack holder. The local authority must show the Court a reasonable excuse for non-collection of refuse. The fact that vehicles were not available for collection was not considered a reasonable excuse nor was the failure to place the dustbin in a position that the local authority thought proper. A strike could be considered a reasonable excuse for the non-collection. No powers were granted to put bins on the highway and it was questionable if the local authorities could require the householder to place a bin at the curb for collection. The question was raised as to the requirement that domestic refuse be placed in a container and whether this would rule out an old chair or a settee as domestic refuse. The decision was, that if the bulky items were lying beside the bin they must be collected. Several definitions were unavailable, such as 'trade refuse'.

65-0021
Liner fined $250 for coastal dumping. Refuse Removal Journal, 8(2):26, Feb. 1965.

The Justice Department fined the Cunard Steamship Line $250 for littering by its liner Caronia off the New Jersey shore. The company still faces possible legal action by the State of New Jersey.

65-0022
MacKenzie, V. G., and K. Flieger. The Clean Air Act amendments and Solid Waste Disposal Act of 1965 (P.L. 89-272). Health, Education, and Welfare Indicators, 1-13, Nov. 1965.

On October 20, 1965, President Johnson signed P. L. 89-272 which amended the Clean Air Act of 1963 and brought into being the Solid Waste Disposal Act. The Clean Air Amendments give the Secretary of Health, Education, and Welfare authority to control air pollution from new motor vehicles, take action to abate air pollution from endangering neighboring countries, seek methods to prevent new sources of air pollution, and expand the Department's facilities to meet these new responsibilities. The Solid Waste Disposal Act enables the Federal Government to help create a coordinated national solid waste disposal program by bolstering the efforts of state and local governments. It authorizes two basic kinds of activity, training and research and grant support for demonstrations and planning of local and state programs. These grants stimulate state, local, and regional agencies to develop and operate disposal systems that are sanitary, efficient, and economical. This act appropriates more than $92 million over the four fiscal years of 1966 to 1969 for the Department of Health, Education, and

Welfare and the Department of Interior. The goal of the act is to reverse the present trend in waste disposal and promote more desirable methods. Additional data, illustrations, and comments are included. (Reprint)

65-0023
Measures taken to ban bootleg burning at dumping areas. Refuse Removal Journal, 8(1):4, Jan. 1965.

New Jersey has begun a drive to stamp out illegal burning at refuse dumping grounds in the North Jersey Meadows. The State had outlawed open dump burning in 1958.

65-0024
Municipal liability for burning of garbage. Public Works, 96(8):180, Aug. 1965.

In City of Purcell v. Hubbard, an Oklahoma court ruled that the city was not liable when a fire in an open burning dump spread to the plaintiff's land. The city was immune because the collection and disposal of garbage was held to be a governmental function.

65-0025
New Jersey group urges state study land leasing practices. Refuse Removal Journal, 8(9):25, Sept. 1965.

The East Orange, New Jersey Council is considering a resolution demanding a State investigation into practices of leasing northern New Jersey meadowlands to refuse contractors. The resolution was prompted by the failure of an association of seven New Jersey towns, including East Orange, to lease a disposal site.

65-0026
Roosevelt, J. Solid waste bill to provide 43 million dollars. Refuse Removal Journal, 8(5):16-17, 30, 34, May 1965.

The speech by Rep. James Roosevelt (D-Cal.), who argues before the House for the adoption of the Solid Wastes Disposal Act of 1965 is reprinted. The act provides $43.6 million for research. The problems of solid waste disposal throughout the ages are described with emphasis on today and possible solutions to the current problems are briefly related.

65-0027
St. Joseph seeks lot clean-up law. Refuse Removal Journal, 8(1):29, Jan. 1965.

The city of St. Joseph, Missouri, is seeking legislation requiring the removal of automobiles abandoned on vacant lots, as well as other debris. The bill now pending before the Board of Aldermen will make it mandatory that private property owners keep their vacant areas clear. Upon violation of this, the city would be authorized to go onto the property and remove the debris and abandoned automobiles. The cost of the removal and disposal would be assessed against the owner as a tax lien, if he refused to clean the land or repay the city for doing it. According to Robert W. Duffe, Director of Public Safety, the derelict autos are abandoned on vacant lots in many parts of the city, and at some spots additional derelicts appear almost as fast as old ones are towed away. He stated that the city now has the authority to remove them from the street, but needs the authority to remove or require their removal from private property.

65-0028
Association news: Solid waste disposal. American Journal of Public Health and the Nation's Health, 55(12):2006-2007, Dec. 1965.

The American Public Health Association recommends federal legislation to assist in solving the problem of solid waste disposal which faces every city and metropolitan area in the United States. The improper storage, collection, and disposal of garbage, rubbish, and refuse, increases the problem of controlling the insect and rodent vectors of disease as well as atmospheric and water pollution. Federal and State programs of expanded research, demonstration, and training are needed to develop satisfactory methods of solid waste storage, collection, transportation, processing, and disposal. The American Public Health Association urges the passage of federal legislation to provide for: (1) an enlarged and accelerated research program for improved and economical methods of storing, collecting, processing, and disposing of solid wastes; (2) technical assistance to State, metropolitan and local governments in planning, development, and conduct of improved solid waste disposal programs; and (3) financial assistance to aid in the establishment of demonstration projects and training of professional personnel in methods of improved solid waste disposal programs. The State and local health agencies should work with and promote coordination among public works, sanitation, and other agencies to assure safe, sanitary, and aesthetically acceptable methods for the collection and disposal of solid wastes.

65-0029
Solid waste programs. Refuse Removal Journal, 8(12):20-21, 34, Dec. 1965.

Provisions and aims of the Solid Waste Act of 1965 are described. Presently only $5 million a year are spent on solid waste research. This act authorizes up to $60.2 million over the next 3 years to be spent on research, training, experiments and studies to find and apply new solutions to waste disposal problems. The provision and machinery of this act are explained briefly.

65-0030
Vehicles classified by materials hauled. Refuse Removal Journal, 8(2):22, Feb. 1965.

The Sanitation Department of New York City classifies vehicle bodies by the types of materials carried to promote public health and prevent the littering of streets. Depending upon the assigned category, extra license or permits are issued. The six classes are: Class 1: transportation of garbage or rubbish (license); Class 2: transportation of ashed or manure (license); Class 3: transportation of materials (other than manure and those in classes 4, 5, 6) originated and produced solely in the business operations of the owner of the vehicle (permit); Class 4: transportation of dead animals, non-edible fats, bones, greases, and other refuse parts of animals, raw hides, or uncrued skins (permit); Class 5: transportation of contents of cesspools, septic tanks, sinks, privies or vaults, and of other noxious or contaminated or polluted liquids (license); Class 6: transportation of swill (license).

65-0031
What federal aid means. Refuse Removal Journal, 8(12):12, Dec. 1965.

Results of the Solid Waste Disposal Act of 1965 are anticipated. More efficient, lower cost disposal, testing of various collecting equipment and long distance disposal systems, and stimulation of private disposal concerns to improve products are projected.

FINANCES (including Costs, Fees, Taxes, etc.)

65-0032
Carozza, M. J. Contract negotiations result in ... prudent equipment purchasing. American City, 80(10):107, 148, Oct. 1965.

The procedure on which Fresno, California, bases its equipment purchases is described. The method requires three steps: (1) inventory analysis; (2) cost and performance analysis; and (3) market analysis. The practical application of this approach was illustrated by the purchase of 20 new packer-type disposal trucks. Using the above-mentioned criteria, the City decided on a lease-purchase arrangement. The contract runs for 5 years, and the City has the option to purchase these units at the end of 5 years at 20 percent of the market value at the time of delivery. The Disposal Division makes double payments to cover this cost. Lease payments go to the local bank, and depreciation payments are placed in an equipment-replacement fund.

65-0033
An editorial. Refuse Removal Journal 8(5):12, May 1965.

Ways of meeting rising costs of refuse collection, including research, the use of latest equipment, expansion of business, and greater efficiency are discussed. Cutting rates are dismissed as unworkable.

65-0034
Eppig, T. C. Refuse collection truck purchase includes guaranteed maintenance program. Public Works, 96(8):98, Aug. 1965.

The 'total cost' of collection trucks is being taken into account in the bidding for the city of Chicago contracts. Contracting companies are expected to provide a guaranteed maintenance program for the anticipated useful life of each truck. Several specifications are cited and one conclusion seems to be that the success of this program is largely dependent upon the good will of both the contractor and the city.

65-0035
Equipment bids must have guaranteed maintenance. Refuse Removal Journal, 8(1):18-19, 25, 28, Jan. 1965.

Chicago now requires equipment suppliers to submit maintenance contract bids, in addition to their regular equipment bids. The first contract under the new bid system was won by the White Motor Co., which will provide complete maintenance for 6 years of 75 of the 100 refuse collection trucks it agreed to sell the city. Chicago has to pay $218 per month per vehicle for the maintenance bid, which contrasts with the previous monthly maintenance average of $293. (The contract is included in full.) Chicago also signed a similar agreement for a tractor dozer for a landfill site.

65-0036
Fales, J., J. Gardner, and H. Peyser. Do trash collection dollars steal away in the night? Part I. Modern Sanitation and Building Maintenance, 17(7):36, 19-21, July 1965.

The staff at Columbia University found that 20.2 percent of janitorial payroll was spent on trash collection. Time was wasted by constant transferring from one container to another. Trash came in contact with workers, making the job unsanitary and distasteful. They decided the ideal system would be a disposal unit in each desk which pulverizes trash and pipes it into the sewer system. As this is too costly, they decided to have disposable plastic bags line all containers. This eliminates washing containers and personal contact with garbage. Offensive odors are sealed off. Time is reduced. They are converting one floor at a time. All waste baskets are washed. The maid is given a supply of plastic bags. The first maid converted showed a 22 percent improvement.

65-0037
Fales, J. T., and J. C. Gardner. Do trash collection dollars steal away in the night? Part II. Modern Sanitation and Building Maintenance, 17(10):24-25, Oct. 1965.

The trash filled plastic liners are dropped into large plastic bags attached to the maids' carts. When the large plastic bags are filled, they are sealed and placed near the elevator. The janitor collects the filled bags and puts them on a cart. One typical maid had almost a 50 percent reduction in labor. Use of the liners is a more economical method of collection although the plastic bags cost more. Maids can increase the amount of floor space they can handle. The occupants of the Law School at Columbia University like this system.

65-0038
Moschell, R. V. Sell tickets for extra collections. American City, 80(9):18, Sept. 1965.

In the past, residents of Middletown, Ohio, were billed individually for special pick-ups, when they exceeded their allowance of 40 gal of refuse per week. The customer had to call for pick-up; a truck was dispatched and the customer was billed. This unwieldy and costly method was replaced by a new system. Residents can purchase tickets in strips of ten for $2 (just $0.20 each), and attach one ticket to each 20 gal can. The extra refuse is then picked up during regular collection days. If they prefer, residents can haul their extra refuse to the city's landfill. The new service does not include yard rubbish which the city collects without charge between April 2 and September 30, if placed at the curb on regular collection days.

65-0039
Report on waste disposal. Wasser und Abwasser, 106(36):999, Sept. 10, 1965.

Upon request of the Federal Ministry of Health, Prof. Gerlach, Berlin, worked out an extensive report on 'cost analysis and investigations of economy of the various different methods for the removal of municipal wastes'. In great detail he deals with the known methods of waste disposal and discusses their economy. Part I of this report appears as number 7 of the series 'Deutscher Arbeitskreis Wasserforschung', Duesseldorf, published at Verlag Erich Schmidt, Berlin. Part II describes 66 plants and provides extensive data. Only a limited number of copies are available at: Deutscher Arbeitskreis Wasserforschung, 4 Duesseldorf, Rosenstrasse 66. (Text-German)

65-0040
Shuval, H. I. Economic aspects of composting in Israel. Public Cleansing, 55(3):155-157, Mar. 1965.

The economics and market for compost in Israel are outlined. A brief description of Haifa's 50 ton per day plant and Tel Aviv's 50 ton per day pilot plant for the 500 ton per day plant under construction there is given. Because Israel has been intensively farmed for centuries, organic fertilizers are in great demand. Prices of $2 to $5 per cu m (about a ton) are paid for different grade composts, the higher grades being the most in demand. The municipalities presently subsidize the operations at Haifa and Tel Aviv by $0.60 per ton and $1.20 per ton respectively, which is cheaper than other sanitary disposal methods. It was estimated that should all of Israel's refuse be composted, only one-half of the country's need could be met.

65-0041
Sludge-incineration costs. American City, 80(6):16, June 1965.

It is suggested that cost data on sewage treatment include incineration of sewage sludge. The ultimate disposal of sludge is becoming more important as urban land becomes more valuable and water pollution must be avoided. For most communities, incineration is the most economical disposal method. Multiple-hearth incineration equipment is free of air pollution and odor problems so that incineration is aesthetically acceptable in any community. An accompanying table gives approximate system and annual operation costs using the B-S-P Multiple Hearth Incinerator, according to size of the community. Both first and operating costs of vacuum filtration and conditioning chemicals are included.

65-0042
Take measures to cut equipment downtime. Refuse Removal Journal, 8(10):16, Oct. 1965.

Sixty percent of every dollar spent for labor goes toward upkeep, but about 35 percent of this total is 'comeback' work. Factors which contribute to 'comeback' work are listed. Some steps that should be taken to reduce costly maintenance are keeping a record of all equipment and proper purchasing and planning.

65-0043
Wuhrmann, K. Which method for rural areas--incineration or composting? Compost Science, 1(6):16-18, Spring 1965.

The safe disposal of residential and industrial refuse is discussed from an economic point of view. Construction and annual operating cost for a city of 100,000 is about twice as high per capita as it is for a large metropolis. There is a demand for centralization and joint construction. The operating costs for the following three types of refuse plants are compared: (1) simple plants processing only residential refuse and part of the bulky wastes and industrial refuse; (2) standard plants processing residential refuse, bulky wastes and industrial refuse, operating on an assembly line basis; and (3) complete plants for all wastes except inert material. In calculating operating costs, power use, water use, and maintenance and repairs are considered. An attempt is made to find the relationship between the population density, the regional area and the average hauling distance, and to check the results by means of a practical example. The average hauling distance of all routes is a factor for the over-all economy of the arrangement. The data show that, with a Type 1 plant, acceptable economy could be attained for 50,000 residents, while, with complete treatment in a Type 2 plant, savings seem very possible even with the enlargement of the region to over 100,000 residents. With a greater density of population or higher per capita yield, the characteristics will change so that appropriate treatment costs must be added to the smaller hauling costs.

STORAGE (including Methods and Equipment)

65-0044
Cans banished from paper-making city. Refuse Removal Journal, 8(1):14, Jan. 1965.

The industry of Dryden, Ontario, is paper-making, and the town has forbidden the use of refuse cans or any receptacle except a special paper sack known as a Refubag, as enforced by a special bylaw passed recently by the Town Council. Dryden is thought to be the first community in Canada to take this action. Wallaceburg, Ontario, is expected to follow suit.

65-0045
Complaints came with the frost. Public Cleansing 55(10):582, Oct. 1965.

East Kilbride, Scotland, has disclaimed responsibility for plastic dustbins cracked during emptying in very cold weather. Complainees were recommended to use a metal dustbin.

65-0046
Container for flammable waste. Brennstoff-Chemie, 46(4):W42, Apr. 1965.

A container for flammable waste is now commercially available. It is made of sheet steel; its dimensions are 40 by 40 by 73 cm. The lid closes automatically, thereby putting out any fire which may arise in the container. Painted red, it is suitable for oil or gasoline soaked cloths and other easily flammable material. (Text-German)

65-0047
Containers for household refuse. Public Works, 96(5):82, 84 May 1965.

A questionnaire was mailed to a group of 600 health officers and sanitarians by the Public Relations Department of the Galvanized Ware Manufacturers Council. The purpose was to determine reactions to containers for household refuse. Replies were received from 234 (39%); some 220 of the 234 said that covered containers are a major factor in controlling rats, flies and disease; 86 percent of the respondents felt that metal cans were the best home system for handling refuse; 34.6 percent combined such containers with food waste disposers as the best system; and another 10 percent combined metal cans with home incinerators. Metal containers were preferred by 98.7 percent. About 30 percent of the cities in the country lack safe cans in more than half of the places where they are needed. This lack was not confined to any particular area or size of city.

65-0048
Davies, A. G. Why Blaydon introduced paper sacks. Public Cleansing, 55(4):221-222, Apr. 1965.

Due to hilly terrain and residential estates which involved long carrying distance of refuse, the Blaydon Council of Great Britain resolved adoption of paper sack containers. Since the sacks have been used, less physical work is required and work is cleaner and quieter. It previously took two men 45 minutes to clear twenty bins; now one man can clear twenty sacks in 5 minutes. During severe winter weather, isolated farm communities did not receive refuse collection. Now the communities receive a supply of sacks which can seal the refuse inside. No nuisance occurs. The sacks are collected when weather permits. The sacks are stable under all conditions, and economical.

65-0049
Development of paper sacks in the North East. Public Cleansing, 55(9):533-534, Sept. 1965.

The two British towns of Whickham and Blaydon with about 3,000 homes each have adopted a paper sack collection system. High population growth rate, and changes in housing developments from compact homes with alleyways to developments with long walks or on hillsides were factors in the change.

65-0050
Dutton, D., and C. Wood. Waterloo, Ont. test plastic bags for refuse collection, APWA [American Public Works Association] Reporter, 32(5):3, 13, 14, May 1965.

A pilot run of one pick-up for 40 houses resulted in favorable reactions and a programmed main test in Waterloo, Canada, a city of 26,000 with once-weekly residential refuse collection. The main test included 563 houses but no commercial or industrial buildings. The 30 by 40 in. bags were manufactured by F. G. Plomp Co., Toronto, from 1¼ ml polyethylene film supplied by W. Ralston & Co., Ltd., Rexdale, Canada. The plastic is green and semi-opaque. Bags were used as liners in regular metal containers with the top folded over the edge. Bags are tied at the top when full and placed as usual at the curb. Generally a driver and one helper could handle the collection, instead of two helpers now employed. At about 20 percent of the stops, other containers were put out for collection, generally for ashes and other items such as newspapers, yard wastes, and bottles. Many bags went through the packer mechanism without breaking up, but there was no problem at the landfill. One hundred and twelve householders were asked for reactions if they had to purchase bags at 10 to 15 cents each and 69 said 'yes'; 10 percent said 'no' and 21 percent were undecided. Some said the bags tore when they were picked up and the manufacturer suggested a smaller bag of 1½ ml thickness. This would cost 8 for $1.00 in local stores. If a metal holder is used, a 2 ml bag will be required at a cost of 6 for $1.00. Large quantities of bags can be obtained at about $5.72 each and they can be distributed for $6.49 each for a 3 months' supply. While labor costs might be decreased as much as $13,316 per year, collection costs would increase by about $27,172 if the city provided and distributed the bags.

65-0051
Ecke, D. H., D. D. Linsdale, K. E. White, et al. Green blow fly studies in Saratoga, California. California Department of Public Health, Bureau of Vector Control, 1965. 17 p.

A multiple comparison rank test was made of fly larval migrations from 222 garbage containers of six different types to determine their comparative value in reducing green blow fly larval migration. The following six systems were studied: metal cans with once-a-week collection, metal cans with twice-a-week collection, Vapona strips in metal cans with once-a-week collection, an exposed paper bag with once-a-week collection, an enclosed paper bag with once-a-week collection, and a liner bag with once-a-week garbage collection. The liner bag system showed no statistically significant improvement over once-a-week garbage can service. Twice-a-week can service, Vapona treated garbage cans, and two systems of suspended paper bags all showed significant improvements over the once-a-week garbage can system. No significant differences were demonstrated between systems in the improved group. None of the systems accomplished total elimination of larval migration even though four showed significantly less migration. No suitable device has been developed by which the Vapona strips can be readily fastened to garbage can lids. The method of adult fly sampling consisted of establishing sampling stations, located in the sun within 3 ft of garbage cans at ground level. Open cans of dog food were exposed for 10 minutes while one observer watched the time and the other recorded the maximum number of Phaenicia which landed.

65-0052
Ecke, D. H., D. D. Linsdale, and K. E. White. Migration of green blow fly larvae from six refuse container system. California Vector Views, 12(8):35-42, Aug. 1965.

Fly larvae production in 6 garbage and storage systems from a study involving 240 residents operating 40 of each system over a period of 10 weeks in Saratoga, California is reported. The methods include weekly cans, Vapona insecticidal lidded cans, weekly exposed freely-suspended paper bags, weekly enclosed suspended bags, and weekly metal-container supported bag liners. Selection of residences, data collecting, and statistical analysis of the study are explained. The results showed significant and approximately equal decrease in the twice-weekly cans, Vapona, exposed bags and enclosed bags systems, but no improvement over weekly cans by using the bag-liner system. Community-wide tests will be necessary for more thorough analysis of these systems.

65-0053
Ecke, D. H. Study finds paper sacks cut fly nuisance. Refuse Removal Journal 8(12):6, 30, 35, Dec. 1965.

Results of six mixed refuse storage and collection systems with regard to fly control are compared. The systems included cans (once- and twice-weekly collections), cans with Vapona strips attached to the underside of the lids, supported sacks, enclosed sacks, and exposed sacks. Great care was taken to equalize variables which could alter or prejudice data in favor of one system or another. Results of the study are analyzed in tables which show that fly larval migration during the 10 weeks of study was greatly reduced in exposed sacks, enclosed sacks, and Vapona cans. Community-wide use of the exposed and enclosed sack units should effectively repress the adult fly population below the pest level. Such a test is being planned in part of Santa Clara County during the summer of 1966.

65-0054
An editorial. Refuse Removal Journal, 8(3):14, Mar. 1965.

The use of detachable containers has grown 1,600 percent since 1958. The new stationary packer is so far in the front rank of containerization. Contractors are urged to keep up with the trend by pushing containerization.

65-0055
400 year old Florida city modernizes with containers. Refuse Removal Journal, 8(1):16, 22, Jan. 1965.

St. Augustine, Florida, the oldest city in the United States, recently added 90 containers for use by the business establishments. The city's narrow alleys and streets pose transportation problems for the modern trucks. The city owns a landfill site. The city employs 17 men to collect the trash and has a safety program, whereby the employees meet once a month to discuss the nature and causes of accidents and injuries.

65-0056
Half of Sweden uses paper sacks. American City, 80(6):61, June 1965.

After 13 years, more than one-half of Sweden's communities are either using or testing paper bag refuse collection. Replacing noisy and unsatisfactory garbage cans with paper sacks is much newer in the United States. Two cities doing so have favorable reports of acceptability and satisfaction. They like the lack of noise, odors, and spillage. There is little cost advantage though collection is faster.

65-0057
Hospital x plastic liners = greater efficiency. Modern Sanitation and Building Maintenance, 17(5):21-22, May 1965.

The housekeeper of a New Jersey hospital found that polyethylene liners cut work and improve sanitation. Before, janitors had to steam-clean swivel cans and waste baskets. Now the janitor picks up the liners and puts them into castered swivel cans which also have liners. The large liners are tied to seal off contents until burned in the incinerator.

65-0058
How paper made College Park, Maryland, a cleaner city overnight. New York, West Virginia Pulp & Paper Company, 1965. 27 p.

The Council and City administrator of College Park, Maryland, were seeking a cleaner, quieter, and more economical system of refuse removal. College Park officials were invited to witness a test operation of the Westvaco Papercan Bag System, which uses heavy-duty paper bags in place of garbage cans. A detailed field test of the system in operation was initiated in College Park in order to study its adaptability to the City's needs, requirements, and budget. A time study, financial review, and controlled test of the system were made. The two-month test proved the System's superiority in service, manpower, equipment, and cost. Homeowner approval was overwhelming, and the system was adopted in College Park in July 1962, with an ordinance made effective January 1, 1963. The city bore the basic cost of putting the program into effect, providing each homeowner with one wall holder and two Papercan bags per week. Six months later, the Westvaco Papercan Bag System was adopted in nearby Riverdale, Maryland. Charts of test results are included, and an evaluation and analysis by the Superintendent of Public Works is given.

65-0059
The Irish Capital gets containers. Refuse Removal Journal, 8(11):26-27, Nov. 1965.

A containerized industrial waste operation has been initiated in Dublin. Advantages include labor efficiency sanitation in a highly agricultural country, and neatness for the tourist. A sanitary landfill is being used to reclaim commercial lands from Dublin Bay.

65-0060
New hardware. Engineer, 199(5156):224, Feb. 12, 1965.

The Hardware Trades Fair, held annually at Olympia, which introduces retailers to manufacturers' new products is described. An example of the increased willingness of designers to study new user needs in 'peripheral' products is the 'Ericol' kitchen waste disposal cabinet. A disposable bag is housed within the waste hopper and since no waste reaches the cabinet, cleaning out is unnecessary. The lining bag is sealed when full with a tie strip which is provided and dustbin cleanliness is assured. Another item mentioned is a vacuum cleaner without a dustbag. The two-wheeled body is up-ended for emptying, two toggle clamps are released, and the wheeled motor unit is lifted off. A conical fabric filter element is removed and the remainder of the case can be easily emptied. A 6 ft suction hose is provided, together with a selection of cleaning tools. The motor is rated at 450 W.

65-0061
Paper bags for waste disposal save hospital money. Modern Sanitation and Building Maintenance, 17(2):19-21, Feb. 1965.

A Pennsylvania hospital uses bags of double-ply Kraft paper used in sizes ranging from 36 to 58 gal capacity. They are fully enclosed in fire-proof containers while in use. Odors are sealed in; flies and pests, sealed out. There is no chance of spillage. The bag is slipped through the front where a hinged panel can be dropped down. The bag is stapled and loaded onto a cart for transfer to a compressing bin.

65-0062
Paper refuse sacks aid land-fill. Modern Sanitation and Building Maintenance, 17(9):30, Sept. 1965.

A year long test in Manchester, England, showed that polythene sacks slowed down the normal rate of decomposition of refuse contained in the sacks while refuse in paper sacks decomposes faster and is better for sanitary landfills.

65-0063
Paper sack unit packs and compresses at site. Refuse Removal Journal, 8(2):22, Feb. 1965.

Designed for commercial and industrial use, the Deva refuse compression system automatically compresses and packs waste material into on-site disposable paper sacks. Six models are being manufactured by a British firm.

65-0064
Paper sacks cut fly larval production. American City, 80(11):44, Nov. 1965.

A 10 week test conducted by the California Health Department showed that paper sack refuse containers reduced larval production to almost that of twice-a-week collection of cans. The test included the use of 30 gal metal cans collected once a week and twice a week, 30 gal metal cans with Vapona strips attached to the underside of the can lids, exposed sacks, enclosed sacks, and liner sacks collected once a week. The exposed sacks were freely suspended from holders, while the enclosed sacks were enclosed in rectangular metal containers. The liner sacks were placed inside regular metal containers. All units rested on rectangular maggot traps designed to capture fly larvae as they migrated from the refuse containers. A table summarizes the total, average, and median production of fly maggots during the test. Total larvae count for once-a-week cans was 249,927; for liner sacks, 150,905; for Vapona 32,793; for enclosed sacks, 38,399; for exposed sacks, 16,200; and for twice-a-week cans, 23,786. Although minor differences existed between the Vapona, exposed sacks, enclosed sacks and twice-a-week cans, these differences were considered not significant in view of the wide variability of the data.

65-0065
Rasch, S. Refuse service is greatest user of bags in Sweden. Refuse Removal Journal, 8(10):23, 32, Oct. 1965.

Refuse collection companies are the greatest users of paper sacks in Sweden. Thirty-three gal sacks are the most commonly used. In some large apartment houses, a paper bag compaction machine is employed.

65-0066
Refuse sacks are in. American City, 80(12):96-97, Dec. 1965.

Mt. Wolf, Pennsylvania, uses the St. Regis Refuse Sack System in lieu of conventional garbage cans. The refuse sacks eliminated the wide variety of miscellaneous unsightly and odorous containers which were placed on the sidewalk the night before collection day where they were disturbed by dogs and attracted maggots and insects. Once the refuse sacks were adopted by the Borough Council, sacks, holders and a year's supply of St. Regis Refuse Sacks were distributed to all homes, but remained the property of the borough. Each sack holds about the same volume as one and one-half normal garbage cans (30 gal); 36,000 bags were distributed throughout the community. Although there were some initial complaints, the people cooperated when they found that their garbage was not being collected if it was not in the sack. The fly population has diminished, and stray dogs leave the sacks along when closed properly. The collection operation is completed in 4 hr instead of 8 and less work is involved as each sack weighs only ¼ lb as compared to approximately 5 lb for the average garbage can. Less time is involved as the sacks are carried only once to the truck, whereas the cans had to be returned to the sidewalk.

65-0067
Sacks quiet apartment pickups. Refuse Removal Journal, 8(5):6-7, May 1965.

New York City's Big Six Towers, a row of apartments in Queens, now stores its refuse in paper bags. This system eliminates noise, spillage on the streets, and contact with refuse and its fumes by the collectors. The paper bags, which save $5,000 a year in refuse handling, can also be carried much more easily up and down flights of stairs. Previously the apartments used 30-gal metal cans.

65-0068
Sacks solve their problems. Public Cleansing, 55(6):336-337, June 1965.

Kirkburton, England, a town with 5,000 homes, is changing to a paper sack collection system. With one-half of the homes now using paper sack wall bracket or wire mesh holders, collection in these areas has increased from 10 day to weekly service. The work is more pleasant and lighter for employees. The new system has already brought a profit account to the city.

65-0069
Sanborn, K. F. Garbage cans? Who needs them? Public Works, 96(3):148,150, Mar. 1965.

Municipal garbage collection crews serve about 50 percent of the population of Junction City, Kansas. Six private contractors serve the remainder. Municipal customers, identified by a card system, receive twice-a-week service using the carry-out method at a cost of $1.25 a month. Compactor trucks on three regular routes serve 2,910 single unit dwellings and 430 multiple units. The main problem was the use of unsanitary, unsafe, and improperly maintained refuse containers. They decided to use the Westvaco refuse system which employs heavy-duty disposable bags hung from metal holders. The bags are manufactured from stretchable kraft paper, treated with wet-strength resins to make it weather-proof and leak resistant. A 250-home pilot study was conducted in July to August 1963. Participating residents were given questionnaires. Of those answering, 88 percent liked the system; 85 percent felt that the bags were more sanitary than metal containers; and 75 percent favored adoption by the city. Paper bags permitted an increase in the number of collections per crew member and decreased daily trips to the landfill from four to two per truck. The presence of a bag holder readily identified a city customer, eliminating the expense of the card identification system. In January 1964, they offered residents the 'Deluxe City Service' of two bags per week plus holder and lid, charging them a total of $1.75 per month, $0.50 per month more than for conventional services. After four months, about 23 percent of the city's customers were receiving the new deluxe service.

65-0070
Study finds sacks decompose at same rate as contents. Refuse Removal Journal, 8(11):42, Nov. 1965.

One year test of polyethylene bags and paper sacks in a landfill in Manchester, England, showed waste in paper sacks allowed normal decomposition, but polyethylene bags preserved the waste.

COLLECTION AND DISPOSAL–General

65-0071
The application of plastics in public cleansing. Public Cleansing, 55(8):451-458, Aug. 1965.

Plastics seem entirely suited as a material for bins, skeps, and litter receptacles, but no satisfactory product has been shown yet. Polypropylene is a low-cost plastic efficient through a wide temperature range, but most have prohibitive costs. Various other problems with plastic sacks are discussed, including the production of black smoke during tipping. There was a question as to the durability of the plastic bins, their weight, tip drainage, and incineration. Linings and coatings for the bins was also discussed.

65-0072
Archer, G. A. Discussion of 'Mechanical Refuse Disposal'. Public Cleansing, 55(8):458-464, Aug. 1965.

Comments were directed at points concerning the use of refuse volume rather than weight in disposal plant design and in collection facilities. A close alliance between collection and disposal authorities, and the need for a correct and overall analysis of refuse on a non-seasonal basis, with projections of the refuse nature in the future were discussed. The use of steel frame plants to facilitate expansion, and the dubious financial advantage of pulverizing before incineration were also mentioned. Advantages of the grab hook over the conveyor for refuse storage and movement were presented. No difficulties in mechanical grate operation from slag formation were reported.

65-0073
Black, R. J. President Johnson spurs nation to act on solid waste problems. Refuse Removal Journal, 8(7):8, July 1965.

A growing public interest in the environment is reported. A general survey of the front rank of refuse handling and disposal, including health, aesthetics, and economical requirements is reported. California has contracted a firm to develop a detailed and long range plan for a state-wide management system. North Tonawanda, New York, is automating sanitary landfilling with a new machine, which simultaneously digs a trench and buries the refuse.

65-0074
City of Reading. Your plan for community improvement. City of Reading environmental sanitation survey. 1964. 14 p.

A sanitation survey was undertaken to determine the nature and magnitude of the environmental sanitation problems in Reading, to inform the citizens of these problems, and to provide a guide for developing an effective long-range program. The survey method utilized measured the percentage of premises having a particular environmental sanitation problem within specified areas of the community. Results showed that 66 percent or 2,413 of the 3,680 premises, where refuse storage was visible, were dificient in storage. Types of improper containers noted were cardboard and wooden boxes, uncovered cans and barrles, and damaged and rested containers. It is recommended that refuse be stored in duable, flytight, watertight, and rodent proof containers, and maintained in a clean condition and in good repair at all times. Refuse collection in the consists of garbage collection by the City and trash collection by private collectors. Unsatisfactory conditions are associated with both of these services. A combined collection system where mixed refuse is collected together is most economical. Open burning of refuse continues to be practiced despite an ordinance that prohibits it. One percent of the premises surveyed contained some type of breeding source for mosquitoes; 8 percent contained some type of rodent harborage. Recommendations for eradicating both these problems are given.

65-0075
Cleaning up the world's fair. Refuse Removal Journal, 8(7):28-29, July 1965.

Four thousand employees of Allied Maintenance Corp. combine to work continuously day and night to clean up the refuse generated at New York's World's Fair. Allied uses a fleet of Cushman Trucksters and hundreds of containers for this project.

65-0076
Cleansing conference discussion. Surveyor and Municipal Engineer, 125(3809):19, June 5, 1965.

Comments are given on several diverse subjects covered in papers given at the Institute of Public Cleansing Conference. R. E. Bevan of Manchester opposed any system that separated the responsibility for refuse collection and disposal. A number of comments were made on the need for research and it was generally agreed that this should be done or financed by the government, and the Institute of Public Cleansing should initiate steps to have a research institute for public cleansing established by the national government. F. McCarthy of Westminster said that because of the increasing problems of transport and controlled tipping, consideration was now being given to a resumption of incineration. The price of plastic bins would never be reasonable for the desired article as long as each authority wanted its own color and design. No fully satisfactory plastic bin is now on the market. The use of plastic casings for domestic refuse will seriously limit reclamation. S. Cayton claimed that plastic bins are so satisfactory that his authority is not buying any more steel bins. It was found that refuse in plastic sacks remained unchanged after months on the tip. It was held by Mr. Perry that when incineration returned, as he was certain that it would, there would be no attempt at salvage and the refuse would be burned as received. While there was a suggestion to trust in the traditional materials, it was indicated that they tended to increase in cost while plastics became cheaper and more versatile.

65-0077
Cleansing in Johannesburg. Public Cleansing, 55(10):567, Oct. 1965.

The refuse collection, disposal, and street cleaning services in Johannesburg, South Africa are described. About 1,400 tons of refuse are deposited daily in 6 sites. Pilot plant composting is underway. City-owned refuse bins are being installed. Street sweeping is done manually.

65-0078
Conference exhibition preview. Public Cleansing, 55(5):238-255, May 1965.

In June 1965 a conference was held in Scarborough, England, which included exhibitions and demonstrations of British-made solid-waste management machines. A guide is presented to the exhibitions, including brief descriptions of the following equipment: refuse collection vehicles, street cleaners, storm sewer and cesspool cleaners, snow clearing machines, protective clothing, and earth moving machines.

65-0079

Contractor matches community growth. Refuse Removal Journal, 8(4):36-37, 50, Apr. 1965.

Among Anaheim Disposal Co.'s industrial and commercial accounts is Disneyland. The company grew with the city until today its 16 trucks haul 125 tons of commercial refuse per day and 75 tons industrial, not including the Disneyland account in the summer, which accounts for an additional 50 tons.

65-0080

Crowther, G. Bulky refuse. Public Cleansing, 55(10):599-601, Oct. 1965.

Bulky refuse and logical guideposts for its control are defined. Cardboard cartons, in excess, may prompt a separate wastepaper collection, or may indicate that the regular dustbin is too small; furniture may be collected by an open truck once a week from scheduled areas. Brick and rubble refuse may be eliminated by educating the public to make sure that the repair or construction contractor disposes of his own refuse, though small amounts of brick or rubble may be accepted at special collection points. Garden refuse may be collected on a similar basis to furniture, with care being taken not to overexpand disposal services.

65-0081

Editorial reflections--modern history. Public Cleansing, 55(3):126-128, Mar. 1965.

This editorial scans the modern history of refuse collection and disposal. It highlights the organizational change towards regional refuse disposal in the formation of the Greater London Council. This regional approach to disposal allows economic planning, pooling of resources, and added hygiene and amenity throughout a large area.

65-0082

Edmunds, J. E., C. K. Wiehle, and K. Kaplan. Structural debris caused by nuclear blast. Burlingame, Calif., URS Corporation, Oct. 1964. 63 p.

Postattack recovery and reclamation operations are concerned, in part, with the production of debris by total or partial callapse of buildings and structures. A number of sources of information were considered in the study: the atomic bomb attacks on Hiroshima and Nagasaki; the controlled nuclear weapons test in Nevada and the Pacific; analyses of these tests and theoretical studies that lead to methods for estimating building damage; the large accidental explosions at South Amboy and Texas City; and reports on natural disasters. The objective of the data reduction portion of the program was to determine the quantities of debris produced by blast for as many different structures as possible. From the data, graphs were prepared relating total debris production to peak incident overpressure for 20 kiloton and 20 megaton weapons. Individual graphs are presented for each of the six building categories, and the information is summarized on two combination graphs for each of the weapon yields, on each of which debris production curves for all building categories are plotted. Recommendations for continued research in this area is given. (Clearinghouse for Federal Scientific and Technical Information AD 450 115)

65-0083

Ehlers, V. M., and E. W. Steel. Refuse sanitation. In Municipal and rural sanitation. McGraw-Hill Series in Sanitary Science and Water Resources Engineering. 6th ed. New York, McGraw-Hill Book Company, 1965. p.151-182.

Collection costs, and quantities of various wastes that may be expected are discussed and the terms: refuse, garbage, rubbish, ashes, dead animals, street sweepings, and industrial wastes are defined. The efficiency of the entire collection and disposal system is partially dependent upon the degree of individual cooperation accorded the storage phase. Refuse collection involves municipally administered programs or contractual operations; selection and training of collection personnel; provision of frequent collection services; selection and maintenance of collection equipment; and record keeping. Advantages, disadvantages, and operational techniques of the following refuse disposal methods are reviewed: dumping, hog feeding, incineration, sanitary landfill, composting, discharge to sewers combined with grinding, and salvage. For small organized communities, it is recommended that refuse be collected by the local government and that disposal be by sanitary landfill.

Collection and Disposal–General

65-0084
Everything goes down the drain. Engineering News Record, 175(21):107-108, Nov. 18, 1965.

The Matthew Hall Garchey system is described. Its basic components are a waste-collector tube that fits into a 5½-diameter drain in the sink and a Garchey bowl hidden under the sink that surrounds the waste tube and traps the waste water drained from the sink. When the waste tube is full, it is lifted up from its seating; a flap in the bottom of the tube opens, and the waste water collected in the bowl washes the rubbish through vertical pipework common to several apartments to a central underground collection chamber. The system will dispose of such items as potato peelings, ketchup bottles, soup cans, coffee grounds, burnt-out light bulbs, etc. Oversized objects will require secondary garbage collection. Blockage in the system can be easily dislodged by poking a rod through the unit. No electrical parts are needed in this system. At weekly intervals or longer, a collection tank truck pumps the garbage from the chamber. A mechanical ram inside the truck's tank compacts the contents into semi-solids and squeezes out most of the water. A truck drain deposits the excess water into the sewer. Installation costs of the system vary from $90 per dwelling to as high as $340. It has been found economical and practical in a 2,630 dwelling development in London.

65-0085
Fast-growing city keeps hauler on the go. Refuse Removal Journal, 8(8):34, 68, Aug. 1965.

The operations of the Great Western Reclamation Company, a private contractor which successfully meets Santa Ana's mounting refuse handling needs are described. It serves the entire municipality, including commercial, industrial and all residential accounts. Only front-end loaders are employed for both container and residential service. Containerized service is operated on a 24-hr-a-day basis, while the downtown commercial zone must be handled on a night collection schedule. The firm uses two landfills and one transfer station for disposal. Through sanitary landfills much useful ground has been reclaimed. Maintenance and repair is handled by a permanent three-man crew that has prevented any significant interruption in service in 2 years.

65-0086
Ferber, M. Waste and garbage removal. Wasser und Abwasser, 106(48):1333, Dec. 3, 1965.

A handbook on the collection, removal and utilization of waste and garbage from households, municipalities, and industries has been published, as suggested by the Ministry of Health of the German Government. The book, written by Walther Kumpf, Kurt Maas and Hans Straub, published by Erich Schmidt Verlag, deals with the history of city cleaning, waste removal as a concern of the Health Department, laws and regulations, statistics, and methods to determine the composition of waste. The collection, transportation and elimination of sludges and oil wastes, costs involved in sanitary landfills and composting, methods of composting, and utilization of compost in agriculture, are discussed. Various types of incinerators are described and the possibilities of slag utilization are outlined. (Text-German)

65-0087
Films. Public Cleansing, 55(11):646-649, Nov. 1965.

Films available on loan from the British Institute of Cleansing are listed. Eighteen motion picture films and 10 sets of slides are available free for training and illustration purposes related to public cleansing and refuse disposal.

65-0088
First and last place big league ball teams use same contractors. Refuse Removal Journal, 8(1):8-9, Jan. 1965.

Derrico Bros. of the Bronx service Shea Stadium, home of the New York Mets and the Jets, and Yankee Stadium, home of the Yankees and the football Giants. One and one-half yard containers store the refuse until pickup.

65-0089
Fleetwood, J. E. Current influences on refuse collection. Surveyor and Municipal Engineer, 125(3809):47-49, June 5, 1965.

Although the producer of refuse is only concerned with the storage on his premises and its timely removal, there must be a well-organized use of labor and machinery to remove the refuse from the premises to the disposal area in the most efficient manner.

The three main factors which must be considered are: What is the material produced? How and where shall it be stored on the premises? and How shall it be removed? The answer to he question concerning what is produced is 'anything', although this consideration is limited to domestic refuse and refuse of a like character. The quantity of refuse varies with the affluence of the area. A higher standard of living has resulted in more cans from pet foods, more children's toys, more perambulators, refrigerators, washing machines, bedsteads, and mattresses. The increased consumption of wines and spirits has increased the yield of bottles and glass. With the decrease in solid fuel devices in the household, there is an increase in the volume of refuse including an increasing number of offensive articles. The paper sack is probably the most hygienic method of storage and removal of refuse. Once the method of storage is decided upon, such as paper sacks, dustbins, or containers, the location of these devices must be convenient to the householder and the refuse collection vehicle. The problem of removal is a matter of men and vehicles. While the vehicles can be obtained in the desired design, there is a problem with the men in training them to the requirements of the job. It is important to impress the men with the importance of their work. Changes in refuse must be met by changes in disposal.

65-0090
Garchey system tests. Public Cleansing, 55(2):115-117, Feb. 1965.

The new Garchey method of refuse collection by tanker truck is outlined. Several multi-story housing developments in London, Sheffield, and Leeds in England are equipped with this system. All possible refuse is washed down the sink to a common collecting tank. The resulting slurry is periodically pumped into the tanker truck, excess water flowing from the truck to the sewer. Tests show about 90 percent by weight of all household refuse can be collected in this manner, the remainder being dry and requiring infrequent collection. The refuse from 300 dwellings can be collected in 3 hr in one load. The system is very sanitary as the refuse is enclosed from sink to disposal site. Diagrams of the Garchey system are included.

65-0091
Gaskell, J. Public cleansing. Public Health Inspector, 73(8):331-337, May 1965.

The weight of refuse collected continues to rise while the yield per house is declining. Refuse is increasing in volume and bulk while decreasing in density. There are many methods of collection and disposal. Disposal of refuse at the source by sink grinders and incinerators located in the apartment complex has grown in popularity, but cannot be applied to every dwelling. Systems of collection, which use specially-adapted trucks or paper sacks instead of bins, have recently been looked upon with considerable interest. Controlled tipping is the most widely used method of disposal and, when operated in the proper manner, is quite desirable. Direct incineration has declined in popularity because of ash accumulation and odor problems, but may evolve again as the amount of combustible matter increases. Separation incineration is more desirable because only about 25 percent of the original material remains to be disposed of after treatment. Pulverization is a pretreatment process which is costly and not sufficiently hygienic, but is a good addition to a controlled tipping program. Composting is not feasible in industrial areas, but aids the build up of rural soil. Still, it cannot be looked upon as the complete answer to disposal. Labor in this field presents a problem that can be solved by improving existing conditions and the public image. New disposal plants should be built to modern standards and be fully mechanized. A pooling of local authority both financial and otherwise is necessary to build them.

65-0092
George, J. C. Recreational area sanitation; refuse handling. In Proceedings; First Conference, Recreation Sanitation and Safety, Little Rock, May 25-26, 1965. Dallas, U.S. Public Health Service. p.71-72.

Proper storage is of upmost importance if recreational areas are to be free from rats, flies, and the junkyard appearance. There must be adequate numbers of well-placed, watertight, rust-resistant, easily washable containers. If the conventional 20 to 30 gal cans meet these criteria, they are acceptable, with certain qualifications, such as container racks which are mandatory for the lightweight type of cans. Racks in recreational areas should be constructed so that wild animals will not upset the cans. Fifty-five gal oil drums make excellent storage containers if tight fitting lids and handles are provided. For campgrounds approximately 0.18 cu ft per person per day of refuse can be expected. Based on this, a 30 gal container can accommodate 30 campers for one day. Twice a week or as much as daily collection is necessary for recreational areas depending on the usage. Acceptable collection vehicles are trucks with watertight, covered beds, closed bed or flat bed if container exchange is used. Packer trucks are ideal. Some modification of a sanitary landfill is necessary in recreational areas because of haul distances. A trench, or several trenches, strategically located, can serve several of the recreational areas.

65-0093
Growing pains. Refuse Removal Journal, 8(8):30, Aug. 1965.

To meet the rapid expansion of metropolitan areas, refuse collection and disposal should be administered on a city-wide basis by contract with both public and private refuse contractors.

65-0094
Hudson, B. J. Refuse disposal. Western City, 41(7):40, July 1965.

A report of 164 Oregon cities has been issued by the Oregon Bureau of Municipal Research and Service. For refuse collection and disposal a majority of cities gave an exclusive license to a private firm or assume direct municipal responsibility themselves either by contract with a private firm or by use of city equipment and personnel. Most cities charge a franchise or license fee, with fees ranging from $.75 to $3.50 with the average between $1.25 and $1.75. In Oregon the trend is toward the packer trucks for efficiency and savings. Sanitary landfills are also gaining public acceptance.

65-0095
Hume, N. B. A million stops daily in Los Angles. Refuse Removal Journal 8(8):38, 50, 52, Aug. 1965.

Los Angeles employes 1,350 workers to collect and dispose of 1.1 million tons of refuse from residential areas and a small quantity of commercial and industrial refuse. The city uses 433 packer trucks for its residential pickups. Food wastes from hotels and restaurants aresold to hog raisers. Dead animals go to processing plants, but the bulk of the refuse is buried in city or county-owned landfills. Refuse is not incinerated because of the city's severe smog problem.

65-0096
Kaupert, W. Meeting of the association of municipal waste collection and city cleaning departments. Satedtehygiene, 16(2):45-47, Feb. 1965.

A meeting of the association of municipal waste collection and city cleaning departments was held in Munich between October 20 and 23, 1964. A number of waste disposal problems were discussed. Since 1950 an increase of waste by 120 percent was recorded and of sludge by 180 percent. The basic requirements for controlled dumping were reviewed, and the costs were discussed. It was found that generally the costs average 0.5 to 1 DM per cu m. Street cleaning problems were also briefly considered. (Text-German)

65-0097
Knowler, W. E. Everyone in Sanford, Florida, likes the sanitation men. Refuse Removal Journal, 8(5):20, 42, May 1965.

Sanford, Florida, augments its public image with the use of modern collection packers and trained men in city uniforms. The city also provides written stipulation on the storage of refuse. Other keys to a good refuse system are: use of large 'tote barrels' to reduce trips to the packer trucks, high employee morale, and the recovery of low waste land by means of a sanitary landfill.

65-0098
Kumpf, W. K. Maas, and H. Straub. Refuse and waste disposal. Berlin, Druckhaus Lichterfeld GmbH, 1964.

A handbook for the collection, removal, and utilization of household, municipal and commercial waste is presented. Collection and disposal of waste has within a few years become a very important and urgent problem. A brief history of city sanitation is presented. The historical relation between municipal sanitation and general health is reviewed. Legal and administrative regulations applying to waste disposal are included. The relation between regional planning and disposal of solid waste is considered from the angle of planning legislation. Types of liquid and solid waste are discussed. Technical terms used in solid waste management and their definitions are presented. The amount and composition of solid waste and special vehicles for refuse collection and discussed. The collection and removal of liquid sludge and city refuse and the disinfection and devitalization of solid and liquid waste are considered. This work is intended primarily for communities and enterprises directly concerned with this field, but also for planning experts and for authorities which askess and approve proposed measures.

65-0099
Kumpf, W., and H. Straub. Introduction and survey. In Refuse and waste disposal. Berlin, Druckhaus Lichterfeld GmbH, 1964.

Representatives and delegates of numerous communities travel as far as the United States to gather information and to obtain suitable solutions in their own sphere of activity. But conditions in one country or even in one community cannot be mechanically applies to another. The danger of incorrect technical decisions and faulty financial investments is therefore great. As early as before World War II the Deutsche Gemeindetag and the then existing Prussian Institute for Water, Soil and Air Hygiene in Berlin-Dahlem dealt with the removal of waste. After the war other associations and scientific institutions also studied this topic. Recently political circles have also begun to take part. In several State Diets, there have been discussions on the difficulties and possibilities of improvement. All the positive and negative aspects of the different methods of disposal have to be carefully weighed and compared. Construction and operating costs may also be decisive. The First Report of the Federal Government on Jan. 31, 1963 to the Federal Parliament is presented. The Second Report of the Federal Government on the Problem of Waste Removal was submitted to the Federal Parliament on Jan. 28, 1966. This is also presented along with subsequent measures and their results significant to developments in waste economy.

65-0100
Meeting of the Bremen, Hamburg, Niedersachsen, and Schleswig-Holstein work groups of the Department for Municipal Waste Collection and City Cleaning, Staedtehygiene, 16(12):277, Dec. 1965.

On November 18 and 19, 1965, the Bremen, Hamburg, Niedersachsen and Schleswig-Holstein work groups of the Department for Municipal Waste Collection and City Cleaning held a meeting. Several papers were presented. The most interesting one dealt with the possibility of dumping the waste into the ocean. No details of the paper are discussed. (Text-German)

65-0101
New Canadian trash baling plan may save city $100,000 yearly. Refuse Removal Journal, 8(4):39, Apr. 1965.

Packer trucks in Hamilton, Ontario, haul refuse to a compressor which meshes it into a bale, one twentieth its original volume. This system cuts transportation costs and greatly extends the life of the city's landfill.

65-0101
Night people labor behind the scenes in New York City. Refuse Removal Journal, 8(6):35, June 1965.

Night people are a key factor in the smooth operation of the New York City Department of Sanitation. Besides around-the-clock teams who operate collection trucks, there are 24-hr watches at the incinerator and transfer operations and aboard the Department's 'Navy'. About 15 men are on the night shift at the incinerator operation, less than half the number required to work the day watch. The night job requires a stationary engineer, incinerator foreman, stationary fireman, crane operator, and checkers at the transfer station. The Department of Sanitation tugboats which tow refuse-laden scows to the huge Staten Island sanitary landfill, also operate through the night. From the incinerator, with four refuse-laden barges, to the Staten Island landfill, the round trip, with another stop in Brooklyn, is 9 hr.

65-0103
Noppen, A. M. Refuse collection and disposal in the Netherlands. In American Public Works Association Yearbook, 1965. Chicago, American Public Works Association. p.232-245.

In an effort to eliminate the refuse accumulating on the street the Corporation of Amsterdam in 1930 started issuing to each household a standard-sized refuse bin (33 liter capacity) which could be emptied practically dust-free into specially built collection trucks. About 3 and 1/3 million of these refuse bins have an average life of 12 years, and their introduction was followed by a mechanization of the whole collection system involving collection trucks with detachable containers of 6 cu m. These containers were exchanged for empty ones by 3 ton cranes at 10 points throughout the city along canals where they were loaded on barges, and then towed to the incineration plant.

More paper was used after World War II, resulting in the doubling of the volume of refuse collected per person per year in the last 15 years. Because of this change in composition of the refuse, it was necessary to compress it, and various packing trucks were introduced. The recent construction of apartment houses has created the problem of transporting the refuse bins in these multi-story buildings. Chutes have provided the most acceptable answer. As a result of the demand for compost which had to meet higher standards, a Refuse Removal and Compost Manufacturing Company, the VAM, was founded in 1930. The composting process is described. The demand for high-grade compost has resulted in the employment of the Dano or the Rasp-system by some towns.

65-0104
Parkhurst, J. D. Refuse handling techniques and developments. In American Public Works Association Yearbook, 1965. Chicago, American Public Works Association. p.254-257.

Refuse collection and disposal practices in Los Angeles County are traced. A report, 'Planned Refuse Disposal', submitted by the Sanitation Districts of Los Angeles County in 1955, indicated a haphazard and unsophisticated collection of refuse by present standards. The report concluded that the only logical method of disposal was sanitary landfilling. It was recommended that the Sanitary Districts finance, acquire, and operate the sites, and five major landfills have been established which presently dispose of about 11,000 tons of refuse per working day, about half the refuse produced in the County. The basic conclusions of the report have proved correct. Each day's refuse is compacted into a single mass and then covered with a layer of earth at the close of the day's operation. No mechanical compaction is applied to the refuse other than that of the crawler tractors. Self-propelled, rubber-tired scrapers are currently being used to excavate and haul cover material. Water wagons are used for dust control on roadways and at the dumping area. The per ton operating costs at the Districts' landfills have remained stable and even decreased slightly in an 8 year period during which general construction costs rose about 30 percent. The 1955 report recommended transfer stations in some areas and one is in operation in South Gate, California. Even though potential landfill sites are still available, other methods of disposal such as composting and disposal in the ocean are under study.

65-0105
Pollock, E. L. England's oldest 'haulier' serves nation's industrial hub. Refuse Removal Journal, 8(9):8-9, 42, Sept. 1965.

Thomas Hancock, Ltd., England's oldest refuse contractor company, collects industrial and railroad refuse and operates 28 landfill sites in England's industrial centers of Manchester, Birmingham, Lancashire, North Midlands, Stokes, and North Wales. The Hancock vehicles have a built-in lubrication system, which has increased the life of truck equipment by 50 percent. Hancock is also a pioneer in containerization.

65-0106
Refuse. In Environmental health report of Savannah and Chatham, Georgia. Savannah, Ga., Commissioners of Chatham County, June 1965. Section 111.

The two municipal landfills now in operation (Savannah and Savannah Beach) as well as the method of collection in these municipalities and the unincorporated areas are brielfy examined. Currently, the City of Savannah is operating a 35-acre landfill and permits refuse disposal for all of Chatham County with the exception of Savannah Beach. Savannah and Chatham County do not have adequate ordinances to institute and maintain control of solid waste storage, collection, and disposal. Residential (52,366 units) refuse is picked up twice weekly and commercial pickup is two to six times per week according to need. Several unsupervised disposal areas exist in the county. The sanitary landfill in the City of Savannah is operated in accordance with the recommended practices of the U.S. Public Health Service. By 1985, Chatham County will have a projected population of 286,000. At the current rate of land usage, approximately 28.6 acres per year will be required. A list of recommendations for future action is furnished. The study is co-sponsored by the Savannah Area Chamber of Commerce, Chatham County Health Department, in cooperation with Georgia Department of Public Health, University of Georgia, Georgia Department of Industry and Trade, and the U.S. Public Health Service.

65-0107
Refuse. In Environmental health survey--Gainesville, Florida. Gainesville, Florida State Board of Health, Apr. 1965. p.16-18.

Gainesville, population 60,000, generates about 150 tons of garbage household, commercial, and industrial wastes per day. By 1985, when the population is expected to reach 96,000, the solid waste is expected to reach 240 tons per day. Four areas are considered in the present methods of solid waste collection and disposal: The City of Gainesville, the suburban area, The University of Florida, and Sunland Training Center. In the City of Gainesville, a refuse collection service is operated by the Public Works Department and households are charged $1.50 per month. A private collector firm provides services for the suburban area at a cost of $2.00 per month. The University of Florida uses incineration for its refuse. Air pollution is a source of annoyance on the campus. The Sunland Training Center disposes of its refuse to a pig farm, and the remainder is incinerated and landfilled. A list of recommendations is furnished for Gainesville. The survey is co-sponsored by The University of Florida in cooperation with Alachua County Health Department and assistance from the U.S. Public Health Service.

65-0108
Refuse collection and disposal. In Environmental health survey, Carbondale, Ill. U.S. Public Health Service, 1965. p.31-35.

A seven-member advisory council on the problems of refuse collection made a report to the Carbondale City Council, and excerpts of that report are given. The need for regulation and implementation of proper refuse storage, collection, and disposal is not only for considerations such as eliminating unsightliness and odors in the city, but the presence of improper storage, collection, and disposal methods of garbage and rubbish will give rise to large populations of flies, rodents, and mosquitoes. These vectors transmit many diseases to cause individual health hazards. The projected population for Carbondale is 81,000 for 1985. The estimated amount of waste for the population would be 204 tons. Currently, there are no required specifications that need be met for containers for the storage of refuse. Solid waste is being collected by the city plus private scavengers, and the refuse is disposed of in the city operated sanitary landfill. The site is not ideal as a portion of the area is occasionally flooded with back water, and water often stands in the trench during rainy periods. Aside from mosquito control, there have been outbreaks of diseases related to vectors; more stringent controls should be exercised. A list of recommendations and illustrations are furnished.

65-0109
Refuse collection and disposal in Kenosha. Public Works, 96(7):135, July 1965.

During 1964, Kenosha, Wisconsin, collected 12,296 tons of combustibles. The cost for collection and incineration was $21.25 per ton; the cost for incineration being about $3.85 per ton. In all, 15,019 tons were incinerated; residue from the incinerator amounted to 3,185 tons. The city also collected 13,098 tons of non-combustibles which cost $16.67 per ton for collection and dump maintenance, of which $1.57 was for dump maintenance. Including non-combustibles from other sources, total material received at the dump was 35,219 tons.

65-0110
Refuse collection & disposal practices. Austin, Texas Municipal League, Oct. 1965. 187 p.

This publication gives information and data on refuse collection and disposal practices in Texas communities. William A. Olsen explains legal opinions supported by selected law cases. General data on collection is given for Texas Cities (A); Salaries and wages of superintendents and collectors are shown by cities (B); and Work-week hours are shown in Table C. Frequency of collection and type of equipment are given in Table D. Table E shows customer requirements and disposal facilities. Residential collection fees are listed in charts F and H; and commercial collection fees, in G and I. Table K gives miscellaneous fees. Section L describes cities not listed in the statistical tables. M includes sample ordinances and regulations while section N shows sample contracts and regulations. Sample forms and notices are given in exhibit O.

65-0111
Refuse collection problems. Surveyor and Municipal Engineer, 125(3812):36, June 26, 1965.

This article covers the discussion on a paper by J. E. Fleetwood titled, 'Current Influences on Refuse Collection'. J. R. Willson of Bournemouth said that, because his community had a high percentage of retired and wealthy people, all refuse contained in the bins was removed and the residents could have as many bins as they wanted. Apparently the 3 ½-cu ft bin is too small for present day requirements. The paper sack and the plastic bin have made collection much easier. In

Northampton, one driver and three loaders making two weekly curbside collections, removed 900 to 1,000 bins a day of 1½ to 2-cu ft size, but one man added made little difference in the collections. It was stated that only the worst type of help would be available, irrespective of the pay rates, because of the working conditions. It was also indicated that as long as men with families could earn more on relief than they could by emptying bins, there would be a serious shortage of labor for this sort of work. Abandoned cars should be removed and stored for the period required by law and then disposed of satisfactorily. Architects should be told of the problem of the cleansing services so that provision could be made in the original plants for location of bins. No sink grinders should be permitted without approval of the sewage disposal authority. Industrial wastes should be handled by private contractors as long as their serviceis satisfactory. The only feasible method of disposing of fireworks is in a trade waste incinerator.

65-0112
Rockey, J. W. Disposal of wastes. In Consumers all--the yearbook of agriculture 1965. Washington, U.S. Government Printing Office, 1965. p.38-42.

Consult local health authorities before building houses or sewage disposal facilities. Discarded paper products and clothing should be kept from sewage disposal systems. Dispose of fecal excreta without contaminating water. A septic tank does not purify, deodorize or destroy solids; it conditions through partial settling and decomposition for soil absorption. As a charge of sewage enters the tank from the house, it displaces an equal volume of conditioned effluent which is discharged to the absorption area. The absorption area should be at a lower elevation and at least 100 ft from any water source and 10 ft from dwelling or property line. If the house has a garbage disposer, allow 50 percent extra tank capacity. A tank should be inspected annually and [illegible] by pumping when the combined depth of sludge at the bottom and scum at the top reach 1/3 the liquid depth of the tank. A privy should be at least 50 ft from the house. A 50-cu ft capacity pit should serve a family of five for 5 to 10 years. Capacity data is given. Commercial deodorants reduce odors. Garbage should be held in covered, watertight, rustproof, containers, cleaned at least weekly. Material may be compacted or burned and then covered in trenches 3 or 4 ft wide, 4 or 5 ft deep, and 7 or 8 ft long. Keep the pile moist to facilitate rotting if making compost.

65-0113
Roeder, W. F. Odors curtailed at transfer point close to capitol hill. Refuse Removal Journal, 8(7):14, 22, 26-27, July 1965.

Washington, D.C., built a transfer station in the heart of the city, designed to eliminate odor and dust. The city tries to reduce its refuse by every possible means without resorting to low ground. Hence, garbage is hauled off to feed over 30,000 pigs in the area; leaves are composted; incinerator ash is used by private and public agencies; and the remaining refuse is transferred to a landfill.

65-0114
Magnitude of the problem. In Restoring the quality of our environment. Report of the Environmental Pollution Panel, President's Science Advisory Committee. Washington, U.S. Government Printing Office, Nov. 1965. p.140-142.

Comprehensive statistics on the magnitude of all solid waste generated in the United States are not available, but even a cursory view gives the impression that mankind is rapidly engulfing itself in its own debris. Data is presented to convey a picture of the quantities of waste and the dollar figures involved in treatment, disposal, and salvage. It is intended to provide a frame of reference rather than an approximate compilation of the gross quantity. A frequently quoted estimate of the unit output of municipal solid waste is 1,600 lb per capita per year or 4.5 lb per capita per day. For our present population this means 250 billion lb of municipal solid waste per year. The collection and disposal costs are estimated to be 1.5 to 2.5 billion dollars. By 1980, the per capita output is estimated to be 5.5 lb per day. Other figures are included which present quantities of waste generated by paper, containers, mining operations, demolition sites, etc.

65-0115
Stirrup, F. L. Other disposal systems and the disposal of trade waste. In Public Cleansing; refuse disposal. Oxford, The Institute of Public Cleansing, 1965. p.137-144.

The Garchey system is a water-borne system where refuse must flow freely. There is a unit in the house where refuse is discharged through the top opening without grinding. Overflow piles allow surplus water to discharge directly to soil drains. To avoid excessive use of water, use waste water. The Matthew Hall-Garchey system eliminates the incinerator. Refuse remains within the collection chamber instead of passing to the disposal unit. Collection vehicles can reduce bulk by disintegration and pakcing as opposed to the normal compression vehicles how used. A Compressing Refuse Collector, which was available in Great Britain, provides the principle upon which such a system could be based. Refuse is loaded through the rear, tumbling against the blades, forced forward, and packed by the weight of the incoming material. Domestic incinerators are expensive and not always hygienic. Disposal of trade and industrial wastes present a question. Are waste from manufacturers the responsibility of the producer, or should municipalities undertake disposal and charge for services levied? The accent is upon recovery of waste material and its utilization within the industry or as raw material for some other product.

65-0116
Stirrup, F. L. Public cleansing; refuse disposal. Oxford, The Institute of Public Cleansing, 1965. 44 p.

This book has ten chapters: (1) Introduction; (2) Refuse composition which includes: seasonal analysis, classes of property, conversion formula, procedure, records, material characteristics, comparative analysis and its use; (3) Assessing disposal methods which concerns: tabular assessment, questions to be answered, legal position, amenity, temperature and climate, material utilization, and beneficial usage; (4) Controlled tipping which discusses: precautions, processes, bacterial action, temperatures, gases, metal breakdown, site selection and value, Liverpool's land recovery, area required, site operation, preparation, soil stripping, tip loads, culverts, drains, methods, layers, litter prevention, covering material, waterlogged areas, equipment, cost, vectors, and future use; (5) Transfer loading stations which covers: simple transfer stations, purpose types, compaction, bulk reduction M.P.L. system, and rail and water transport; (6) Pulverization and grinding which concerns: the pulverizer wear, nature of refuse, types of pulverizers and grinders, and effects of ground material in tips; (7) Composting which includes: history, use of sludge, manure formation, systems, and processes; (8) Incineration which discusses: refuse analysis, sites, dust extraction, furnaces, and grates; (9) Salvage and utilization which covers: waste paper, baler, boxes, metals, textiles, glass, by-products; and (10) Other disposal systems and the disposal of trade wastes.

65-0117
Study probes a single waste system. American City, 80(6):168, June 1965.

Aerojet-General is assigned to an extensive study of waste management control and the possibility of considering sewage, refuse, and air pollution as one system under a $100,000 contract with the state of California.

65-0118
Tauber, F. 'Pro Aqua' Exhibition in Basel, Switzerland. Staedtehygiene, 16(9):208-209, Sept. 1965.

Approximately 200 companies from 11 states participated in the 'Pro Aqua' exhibition in Basel, Switzerland. The Passavant sludge/ash process in which the sludge is dehydrated in a filter press and subsequently incinerated, was demonstrated. Moreover, various types of waste collecting trucks and hammer mills for crushing the waste were on display. The incinerator, displayed by the Machine Manufacturing Company Esslingen, West Germany, aims at discharging a completely sterilized slag. The Koopers Wistra Furnace Manufacturing Company offered a plant for incinerating acid resins and oily resins. The companies Buehler and Dano displayed composting plants and magnetic drums. (Text-German)

65-0119
Walton, G. Institutional sanitation. 2d ed. Washington, U.S. Bureau of Prisons, 1965. 322 p.

This revised edition is designed for institutions such as prisons to aid in establishing and maintaining sanitation programs. The sanitation problems of the Federal Bureau of Prisons are similar to any other community's problems of water supply, waste disposal, food sanitation, rodent and insect control, and housing. Institutional sanitation is effected by: personnel of the U.S. Public Health Service, the chief medical officer of the institution, or the sanitary supervisor, who is a service officer with limited training in sanitation. The purpose of this manual is to provide guidance for the sanitary supervisor. Standards of sanitation have been selected, the scope and nature of the work to be performed by the sanitary supervisor is indicated, and useful information with respect to the performance of duties is provided. The contents include: The Sanitary Supervisor & His Work, Introduction to Bacteriology, Communicable Diseases, Water Supply Sanitation, Plumbing, Bathing & Pool Sanitation, Sewerage & Sewage Treatment, Garbage & Other Refuse, Food Service Sanitation, Canning Sanitation, Milk Sanitation, Ice Sanitation, Meat & Slaughterhouse Sanitation, Public Health in Housing, Housekeeping, Control of Insects & Other Arthropods, Rodent Control, Disinfection & isinfestation of Bedding & Clothing, Barber Shop Sanitation, Industrial Hygiene Engineering, Radiation Protection, and Sanitation Test Equipment & Its Use. An index is included.

65-0120
What was on show at Scarborough. Public Cleansing, 55(9):502-514, Sept. 1965.

The 1965 Scarborough, England, exhibition of refuse collection and disposal equipment in Britain including remarks on the machine demonstrations is reviewed. Packers, street cleaners, container handlers, gully cleaners, protective clothing, and landfill equipment are discussed and illustrated.

65-0121
Wiley, J. S. Report of a special study of refuse disposal at Kwajalein Island, Kwagalein Atoll, Northern Marshall, Apr. 20-23, 1964. San Francisco, U.S. Department of Health, Education, and Welfare, 1964. 11 p.

Kwajalein Island has a population of about 3,900. Refuse is collected every two days from the various civilian and military installations of Kwajalein. Refuse, except for the separately collected garbage, is dumped along the south side of the west end of the island. At intervals the refuse is burned as much as possible. After burning, the unburned refuse is bulldozed over the berm into the ocean. Yearly estimated amounts of refuse, based on a 6-day collection week, are emthod of refuse disposal is the most widely used generally the least expensive approved method of disposal. Properly operated sanitary landfills will eliminate all of the health and nuisance factors associated with open or burning dumps. An alternate method of disposal consists of separation and composting of the combustible refuse with ocean disposal of the non-combustible wastes. Barging refuse and garbage to isolated areas, with burning of combustibles and ocean disposal of non-combustibles is not normally approved, but appears to be satisfactory for the peculiar situation existing at Kwajalein. Incineration is not recommended because of the cost. The present methods of disposal at the Kwajalein site are regarded as unsatisfactory because of health, nuisance, and safety hazards that are created. These hazards are summarized. Recommendations are made for the extensive use of sanitary landfill, composting, and barging to Carlos Island. Costs for these methods are given.

COLLECTION AND TRANSPORTATION OF REFUSE

65-0122
Andrews, L. H. Refuse trains keep trash collection on schedule. American City, 80(9):18, Sept. 1965.

For the past 8 months, six refuse trains have collected brush once a week in St. Petersburg, Florida. Each train consists of either three LoDal or three Dempster trailers towed by Ford or Chevrolet ½- or ¾-ton pick-up trucks. Two 24-yd consolidation packers, one LoDal and one Dempster, act as 'Mother Packers' for the trains. The trains augment the collection service provided by a fleet of 28 trucks, and service nearly all sections of the city. Since the low trailer beds facilitate the loading of brush and grass, the trains were found more effective for brush than for garbage collection. Recently, eight 20-yd Garwood packer units mounted on International chassis were added to the sanitation fleet for garbage collection.

65-0123
Ballard, M. A. A golf-cart refuse toter. American City, 80(6):61, June 1965.

Two North Carolina towns found refuse handling easier, more efficient and less-accident-causing if tubs used for back-door pick-up were on wheels. An oversized golf cart designed to carry a 50-gal toter was developed. The toters have reduced collection crews from five to four and have allowed a $9,000 budget cut.

65-0124
Baumann, H. Collection and removal of solid waste. In Refuse and waste disposal. Berlin, Druckhaus Lichterfeld GmbH, 1964.

Special vehicles for refuse collection are discussed. This includes principles of design and operation of refuse-collecting vehicles, open vehicles, vehicles with closed bodies, vehicles of closed design for dustless refuse collection, special vehicles, transport vehicles with large receptacles, vehicles for transporting bulky refuse and bulky loads, and vehicles for transporting bulk containers. Vehicles with closed bodies, devices for compressing the refuse, and universal receivers at the vehicle rear are also discussed.

65-0125
British Anzani developing detachable skips. Waste Trade World, 107(26):7, 9, Dec. 25, 1965.

The large-scale development of detachable skips for scrap handling and transportation is described. Although skips have been used in scrapyards in conjunction with cranes, their use as detachable truck bodies on a standard chassis fitted with a hydraulic loading/unloading mechanism is comparatively new. Advantages include ease and speed of handling, one-man operation throughout, dual purpose transportation, tidiness, and uniformity in day-to-day operation. The skip can be loaded or unloaded in 30 seconds in a push-button operation. The only manual effort is the releasing or attaching of the hooks which secure the container during transit. The adapted vehicle can be used either as a detachable skip transporter or as a dumper; the bottom is completely sealed, making it useful for handling such materials as oil-contaminated swarf. One standard truck chassis, fitted with the hydraulic attachment, can handle scores of skips and maintain an efficient and economical site-clearance service. Two models are available: the standard skip with a capacity of about 6 tons and the extended skip which is 2 ft higher with a capacity of 8 tons.

65-0126
Central lubricant system installed in 100 Detroit packer units. Refuse Removal Journal, 8(12):14, 16, Dec. 1965.

Types of central lubricating devices for refuse vehicle fleets which provide timed, automatic greasing of vital bearings and points from a self-contained unit are described. Average manual lubrication frequency in the refuse industry is 32 times a year. Advantages of central, automatic systems are better equipment maintenance and less off-time for service.

65-0127
Collection method issue raised again. Refuse Removal Journal, 8(6):32, June 1965.

The question of rear-door collection versus curbside pickup, a concern of residents for over 30 years, was raised again in Millburn, New Jersey. The present operation requires residents to carry their refuse cans at night and return them in the morning when emptied. Often the cans stay in front of homes all day, an unsightly practice. A rear-door collection system would cost the community up to $150,000 more, which might mean a 7-point tax rise to the community. The rear-door collection had been tried in the 30's but it was dropped because of the extra work involved. Various civic organizations have suggested changes from time to time such as a study to determine the cost of rear-door collection. One civic association supported a compromise solution, suggesting that residents carry the cans out, and collectors haul them back to the rear door.

65-0128
College co-ed cleans vehicle and helps dad on collection route. Refuse Removal Journal, 8(2):18, 30, Feb. 1965.

Kilbride's Refuse Service of Amherst, Ohio, uses a unique water tank and pump system attached to its chassis to clean its customers' containers. The Company operates one truck.

65-0129
Current influences on refuse collection. Public Cleansing, 55(8):474-477, Aug. 1965.

Many British homes have two 3¼-cu-ft garbage cans. The refuse volume appears to be increasing, but the refuse collectors' work load is lightened with paper sacks and plastic cans. The work output of 1,000 cans per day with a 3-man team plus drive was not commensurately increased with a 4-man team. Architects need to be more aware of the necessity for designing economical and practical refuse disposal for buildings and homes.

65-0130
Danforth, H. L. How to solve the holiday collection problem. American City, 80(3):20, Mar. 1965.

Tucson, Arizona, solved the holiday collection problem by squeezing its regular collection into four days instead of five, leaving Wednesday and Saturday open for trash collection when a holiday falls on one of the regular scheduled days. A new train system, which has shown substantial savings, collects 65 percent of the refuse.

65-0131
Denver builds transfer station. Refuse Removal Journal, 8(5):32, May 1965.

Denver, Colorado, is building a trash transfer station, which will be a roofed, reinforced concrete building with two ramps. Collection trucks will dump refuse from the upper ramp to the transfer trucks on the lower ramp.

65-0132
An editorial. Refuse Removal Journal, 8(1):14, Jan. 1965.

A few changes in refuse collection over the past 8 years including the rise of containerization, the switch from open body trucks to compacting refuse body trucks, and the rise of local and regional organizations are noted. The Journal's influence on the Sanitation Industry is discussed.

65-0133
An editorial. Refuse Removal Journal, 8(7):12, July 1965.

A progressive refuse collection operation sets aside a portion of its operating costs for advertisement and business promotion and entertainment. The schedule of operating costs published in the 1965 Sanitation Industry Yearbook provides guidelines for establishing rates.

65-0134
Efficiency of MPL bulk refuse-system proved. Public Cleansing, 55(8):485-490, Aug. 1965.

The maximum payload system at Hammersmith, England, where presently 6,600 tons of the 9,000 tons per 3 months are handled in 3 MPL vehicles with 14-ton load capacities operating from one press at the transfer station is described. Vehicle capacities, refuse loading and handling methods, labor requirements, advantages of this system over open hauling, and the gradual implementation of the system are explained.

65-0135
Efficient and noiseless waste removal. Staedtehygiene, 16(5):126, May 1965.

The municipal street cleaning department in Duesseldorf, West Germany, introduced a new lift and tipping mechanism on their waste removal trucks. The full containers are picked up noiselessly by the trucks. At the disposal site or at the incinerator plant the containers are hydraulically tipped and emptied. Fifty or 60 containers--the exact number depends on the distance between the disposal site and the location of the containers--can be picked up by one truck. An empty container is left instead. The new method is quite advantageous. It saves personnel, the load-up and unloading takes only 3 minutes, and space is saved. The large container can hold the waste of 40 waste cans. (Text-German)

65-0136
Employees suspended for stopping work. Refuse Removal Journal, 8(2):27, Feb. 1965.

The Civil Service Commission of St. Louis, Missouri, has set aside a part of the suspensions of 16 of the 74 refuse collection employees who were disciplined a year ago for refusing to work in adverse weather. The ruling held that city officials were correct in removing the workers from the payroll for the half-day on which they did not work. The commission reported that there was no contention that the weather or the condition of the streets furnished a reasonable or proper excuse for refusal to continue work, but that the sole issue is whether the employee actually refused to continue the performance of his duties. The uspensions of 3 days, added as a disciplinary measure, were set aside for 14 drivers and two collectors on the grounds that city officials had failed to prove that these employees had refused to work.

65-0137
Flexibility: Contractor's key to sports arena collections. Refuse Removal Journal, 8(8):24-25, Aug. 1965.

Fleet Disposal, Inc. services large commercial and industrial enterprises as well as the Los Angeles Sports Arena. The firm has 3,000 containers, which enable it to use one truck with one man per route. Fleet constantly reviews its collection procedures to insure efficiency.

65-0138
Free city collections no bar to contractors. Refuse Removal Journal, 8(9):16, 18, Sept. 1965.

When Adams Run Services, Inc., expanded into the industrial area of Charleston, South Carolina, it competed against free municipal collection. But it was successful because of its use of containers and its adaption of service to the customer's needs.

65-0139
Green, L. B. Keep refuse collectors on the route. American City, 80(6):110-111, June 1965.

Some routes in Montgomery, Alabama, require a 23-mile round trip to the disposal site which has resulted in a 2 to 3 hr time loss. To provide a high level of service at minimum cost, officials felt it necessary to keep collectors on the routes and to buy ten garbage trains. Each train consists of three LoDal trailers holding 5 cu yd towed by a Kaiser Jeep or International Scout. The trains are used on the ten most southern routes in the city because they are farthest from the disposal site. They rented a storage lot centrally local between the ten routes and near the freeway. The truck and train combination has reduced fuel consumption from between 25 and 30 gal per route to about 10 gal per route.

65-0140
Growing demand for LoDal home train systems. Western City, 41(7):36, July 1965.

LoDal, Inc. has taken over the former Ford plant at Kingsford, Michigan in order to keep up with the demand for LoDal Residential Train Systems. The train, towed by a Jeep or Scout, consists of three steel containers, each on a single axle with pneumatic tires. These trains rendezvous with a LoDal Transfer Truck, a high capacity compactor, which alone takes the refuse to the dumpsite. The City of Tucson, Arizona with 40,000 stops saved $5,600 a month with this system in 1963.

65-0141
Half of Birmingham 'Dustless'. Public Cleansing, 55(4):203, Apr. 1965.

About one-half of Birmingham, England's 300,000 homes are now served by a dustless collection system, using pneumatic can lifters at the rear of the truck. Special problems have arisen in the removal of bulk items with suggested solutions of a special tray or space for bulky items on the truck, or separate pickup by request.

65-0142
Haller waste removal trucks at an exhibition in Munich. Staedtehygiene, 16(3):77, Mar. 1965.

Haller has built a new truck which will receive and compress even refuse containing bulky objects. The truck is presently being tried out in various municipalities. So far it has proved to be very satisfactory so that a new series of trucks is being produced with respective volumes of 10, 14 and 17 cu m. An obliquely arranged transporting wheel squeezes the waste through an opening with an average height of 20 cm into the interior of the truck. The waste piles up until it reaches the distribution auger hanging down from the hull top which spreads out the waste evenly across the entire loading space. The load is tightly compacted into a package which can be easily discharged when the rear part of the truck is tilted. (Text-German)

65-0143
Jacobson, A. Barges collect refuse in Venice. Public Works, 96(3):140, Mar. 1965.

Galvanized iron flipper lid cans have been placed at convenient locations in each street in Venice. Individuals must put their bagged garbage into these containers to be carted daily to central loading points where the refuse is transferred to motor scows having closed mechanized dumping systems which dump their loads at a dumping point near the main land.

65-0144
Jorgensen, P. J. Barges in Holland haul refuse to incinerators. Refuse Removal Journal, 8(12):10, 33, Dec. 1965.

Three primary means of waste disposal in major Dutch cities: incineration, composting, and landfill are described. There are 15 composting plants operating in the Netherlands. Some are rasping plants which rotate the material by means of projecting arms, reducing it in size, and separating out pieces of ferrous metal. The compost thus produced is generally sold in bulk. Others are Dano plants, where bio-stabilizers process the material by passing it through increasingly higher temperatures. The resultant compost is stored before final disposition is made. Composting and rasping facilities have not become objectionable in any manner. In two composting installations near Copenhagen, sludge from adjacent sewage treatment works is incorporated into the compost. A special method of refuse collection prevents direct exposure to the air.

65-0145
Kampert, W. Collection and removal of liquid sludge and city refuse. In Refuse and waste disposal. Berlin, Druckhaus Lichterfeld GmbH, 1964.

Principles of design and operation of vehicles for the collection and transportation of liquid sludge and oily refuse are discussed. The laws and regulations in force, general requirements, size of vehicles, and types of drives are included. Collection and removal of excrement and sludge are discussed. Sludge-suction vehicles with additional equipment for cleaning gasoline separators, vehicles for cleaning gasoline separators, vehicles for eliminating oil traces and vehicles used in case of serious oil accidents are discussed. For collection and removal of crude and industrial sludge tank vehicles, sludge-suction vehicles of special design, and oil-tank cleaning vehicles are discussed. The organization and costs of collection and removal of sludge and oil-containing liquids are discussed.

65-0146
Kildoy, G. W. Refuse train brings three-way savings. American City, 80(1):88-90, Jan. 1965.

Winston-Salem, North Carolina, has switched to the train system of refuse collection. The use of 27 refuse trains and six packer trucks has produced savings in initial, maintenance, and operation costs as well as savings from the elimination of one route. Other advantages and some disadvantages in using this system are also outlined.

65-0147
Koukal, R. The City of Zurich introduces trash ducts in buildings. Schweizerische Bauzeitung, 83(48):889-891, Dec. 1965.

With the introduction of the transportable 800-liter containers Zurich is now able to use the trash duct disposal method for apartment houses, hospitals, etc. It is about to be installed in two buildings under construction. Since the installation of a trash duct in a completed building is often impossible, it is advisable to plan for it in new housing projects. Their location must be carefully selected so that no residents are disturbed by the noise of trash tumbling down the duct. The disposal inlets must be easily accessible and are best installed in the common hallway of each floor. They must seal off the duct tightly. The reception chamber at the end of the duct must agree in size with the container, must be ventilated, easily cleanable and must be closed by a fireproof door. Additional storage room must be provided for enough containers to hold all trash accumulating in a week. The bulky waste which cannot go down through the duct must go to one or two containers in the storage room assigned for this purpose. Special 10-liter trash cans for the kitchen have been designed which will empty easily into the duct without jamming it or producing dust. Details of the construction of the trash duct and dimensioned drawings are given. (Text-German)

65-0148
Load lugger makes its bow. Waste Trade World, 107(16):17, Oct. 16, 1965.

The Telehoist Load Lugger materials handling system will be displayed and demonstrated for the first time at the Scottish Motor Show in Glasgow, Nov. 12-20, 1965. The system is for basic vehicle chassis up to 22 tons. Chassis are equipped with a flat-bed platform and hydraulically operated loading boom, pivoted at the rear of the chassis platform. Stabilizers automatically provide support during loading and unloading and a pivoted hook engages skips for dumping. All operations are cab-controlled. The Load Lugger can handle a variety of materials, both solid and liquid, in open or closed skips, also packaged or loose pelletized loads. The firm claims considerable cost savings over alternative handling methods, with savings on labor, maintenance, and licensing alone paying for the system in less than 12 months. The complete Bedford TK and Load Lugger system sells at about £3,750.

65-0149
McDonald, J. P. One-man refuse collection. American City, 80(9):93, Sept. 1965.

A 3 month test, using a modified open truck and paper system, proved that one-man refuse collection is possible in College Park, Maryland. A second-hand mail truck body was extended to give it a 10 cu yd capacity, and a hoist was added for rapid unloading. Results of the test indicated an annual saving of $17,000. Another factor contributing to the success of the experiment is the relatively short distance to the landfill--from 1 to 8 miles, depending upon the collection route being serviced. The human element probably presents the most complex problem of the new system; since the men object to working alone, increased wages have been proposed to compensate them.

65-0150
More refuse collected with less work. American City, 80(7):26, July 1965.

A small 3-wheeler collection vehicle used for picking up refuse in the sparsely populated suburban county of Wyandotte, Kansas is described. The vehicle collects from about ten homes and then empties directly into the packer truck, saving an estimated 26 man hours monthly.

65-0151
Municipal departments slowed down by employee shortages. Refuse Removal Journal, 8(11):34, Nov. 1965.

City sanitation departments with worker shortages are trying student workers part-time. Lower overall waste volume with home garbage disposal unit requirements are noted.

65-0152
News report. Staedtehygiene, 16(10):8, Oct. 1965.

Haller GmbH, Stuttgart, designers and builders of specialized vehicles, developed a new 10 cu m trash collecting truck. Also new is a truck for collecting trash from 1.1 cu m trash containers. Lifting and tilting of the containers are activated hydraulically. A novel street cleaning machine holds 2.5 cu m and sweeps 4 to 15 km per hr at a width of 2.2 m. A water tank holds 600 liters for spraying. All mechanisms are hydraulic. Only one engine powers this vehicle which weighs 5.5 tons. (Text-German)

65-0153
19 miles not too long for Toulon. Public Cleansing, 55(2):75-78, Feb. 1965.

Toulon, England, now utilizes a landfill site 19 miles from the town. Use of an efficient transfer station, which gravity fills the four 53-cu-yd capacity Dumpster trailers carrying 16 tons a piece, facilitates removal of 140 tons per day of raw refuse. Use of articulated trailers at dumpsites is a problem, and a special tractor with a half-truck or twin driving axles for constant use at the site was suggested. The feasibility of long-distance haulage is shown, and variants of night haulage are also possible.

65-0154
N. W. Centre members see Oldham's workshops, discuss transport pool. Public Cleansing, 55(4):223-232, Apr. 1965.

Oldham, England, has instituted a central transport pool, under the direction of the sanitation department. Because most of the 145 vehicles serviced were used for refuse collection and transport, and were also the most difficult to service, the sanitation department was chosen to control the pool. The facilities of the new central workshop, its policies and organization, reasons for its institution and its operating advantages are explained. Be consolidating small municipal departmtnes into one motor pool, better maintenance, better repair facilities, better stocks of spare parts and spare vehicles, and more variety of vehicles would result. A brief discussion of pros and cons, particularly on management of the motor pool is included.

65-0155
One man's burden. Public Cleansing, 55(11):633, Nov. 1965.

A British Occupational Safety and Health booklet on maximum permissible weights that can be carried by one worker is reviewed. A Geneva meeting of experts advocated vocational training to reduce lifting accidents and medical supervision to prevent employment of those unsuited for lifting. A maximum weight load of 88 to 110 lb was recommended for adult males. The booklet also contains an outline of National Law and Practice on carrying loads.

65-0156
Packer speeds conditioning in Santa Fe Freight yards. Refuse Removal Journal, 8(6):8, 18, June 1965.

The Santa Fe Railroad's repair and conditioning station in Clovis, New Mexico, has a new refuse collection system, consisting of a 21-cu yd Hobbs Hyd-Pak. The packer enables a faster and much more efficient clean-up than was previously obtained by small open-top trucks and wagons.

65-0157
Patemoster, A. C. Two-wheel traction for packer body trucks. Public Works, 96(1):78, Jan. 1965.

The installation of a two-wheel-traction type of differential on five of the refuse packer trucks of East Detroit, Michigan, has greatly minimized stalls and wheel-spinning.

65-0158
Pingeon, E. Use of the Rhone River for the transport of garbage and residual sludge from the filtering plant of Aire. Bulletin Technique De La Suisse Romande, 91(14):217-224, July 1965.

As part of a plan to remove solid wastes from the city of Geneva, a model of the Rhone-Arve River junction was made in order to determine the size of tugboats and barges to be used to haul the solid wastes, as well as the maximum river flow for safe handling of the barges (river flow controlled by hydroelectric dam at Verbois). The loading site of the barges is at the junction of the two rivers. A curved section of downstream river bed was also modelled and the river bed corrected for better small-craft navigation. Downstream, the solid waste destruction plant receives the barges in a canal where an elevator lifts the barges to the required height for unloading. The pace of this river traffic is determined by the needs of the furnaces, which consume between 200 and 400 tons per day. Reception silos can hold surplus wastes until the furnaces can receive them. (Text-French)

65-0159
Problem of the missing workers. Public Cleansing, 55(11):643-644, Nov. 1965.

Britain is facing an acute shortage of men willing to staff the street cleansing and refuse collecting departments. Labor shortages mean a cutback in refuse collection. The Reigate Bourough Council were recently given details of how their labor force has shrunk. In 1953 the Council had 35 street sweepers at work. By 1963 the figure had fallen to 23. Today it is 16. The unsuccessful effort to recruit more men is blamed on two major factors--one, that Britain is enjoying boomtime employment rates and secondly, that manual workers in local government are at the back end of the earnings table. The combination of these factors means that more and more workers are choosing factories and their bigger pay packets in preference to local authority employment.

65-0160
Quon, J. E., A. Charnes, and S. J. Wersan. Simulation and analyses of a refuse collection system. Journal of the Sanitary Engineering Division, American Society of Civil Engineers, 91SA5(1):17-36, Oct. 1965.

A mathematical, computer-programmed system for optimizing refuse disposal systems is explained. The computer simulates variables in the daily route method of refuse collection with the following: hours required to complete the task, frequency of trips to the disposal site and distribution of activities at the site, overall efficiency, truck capacity, service density, average and variation in the amount of refuse collected daily, haul distances, the frequency of service, and the number of unloading docks at the disposal site. Applications of the technique include use in instituting and revising refuse collection systems, equipment and disposal sites to make them more practical and economical.

65-0161
Road rail freight container handling. Public Cleansing, 55(7):390, July 1965.

The Dempster 'Sideloder' is developed to meet a growing demand for integrated road-rail movement of containerized goods. This Sideloder is highly mobile and can be sent almost anywhere for unloading or transfer work, and needs only a single operator. Railroad flat cars and road delivery trucks are easily adapted to this innovation. Prices of Sideloder units together with chassis are expected to be £8000 to £9000, while converting costs of rail flat cars would average less than £200 each. Development of the Sideloder may lead to the growth of a new medium for the long distance hauling of refuse, which appears to be the only practicable buffer between the absence of local landfill sites and the relatively high costs of mechanical disposal. With the Sideloder, there are substantial reductions in time and labor, due to the elimination of handling and reloading.

65-0162
Special units collect movie lot sawdust. Refuse Removal Journal, 8(11):10-11, 32, Nov. 1965.

The formation and operation of the diversified G. I. Rubbish Company, whose 31 trucks and 115 transfer bodies are responsible for the collection of refuse from movie studio lots is outlined. Sawdust collections from these lots and from commercial building demolition sites are made possible by special collectors which blow the wood waste through a rubber sock into the compartments of a transfer body. G. I. also serves the U.S. military installation of Fort MacArthur in San Pedro and the U.S. Nike site in the San Fernando Valley.

65-0163
Stirrup, F. L. Transfer loading stations. In Public cleansing; refuse disposal. Oxford, The Institute of Public Cleansing, 1965. p.48-58.

Installation of transfer loading stations becomes necessary when the final disposal site is at so great a distance that direct haul by collection vehicles becomes uneconomical. The station may be a simple structure which accepts collection vehicles and transfers their loads to bulk haulage vehicles of larger capacity. It may use full separation plant facilities for recovery of usable material and outloading of unusable refuse from the top or with a loading shovel. Reduction of volume may be achieved by extraction of bulky unsalvageable material; compression by bulldozer; pulverization or shredding; static compaction within a building; or compaction within a vehicle. If road access to the tipping area is either limited or non-existent, rail and water transport will have to be used. Road haulage requires three phases: loading, conveying the load, and discharging. Rail or water transport requires five: loading barge or rail truck, conveying load, unloading conveying vehicle, loading auixiliary transport, and unloading auxiliary transport at tip face.

65-0164
Submissions to the working party. Public Cleansing, 55(3):134-136, Mar. 1965.

Recommendations made by the British Institute of Public Cleansing to the Working Party on Refuse Collection set up by the Ministry of Housing and Local Government are reported. Need of a permanent research organization for the solid waste field was noted. Standard use of a larger, municipally-provided garbage can was suggested. Certain unsanitary methods of collection were discouraged, but weekly collections by ordinary garbage cans with care, by a 'dustless' system, or by paper sacks were all advised. Local agencies were recommended to expediently collect bulky refuse from homes free of charge, and increase illegal dumping punishments. The institute encouraged city ordinances for mandatory approval by the refuse collection department of refuse collection facilities in all proposed buildings and housing developments to insure hygienic, economical service. It was also submitted that refuse collection justified a separate department headed by a full-time specialist.

65-0165
Taylor, R. C., L. E. Crane, and W. R. Lynn. Collection techniques. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.E-1 to E-34.

The factors to be considered in collection are either fixed by policy or open to determination. Two basic methods, which are sub-divided, are: definite task assignment for individual crews, and integration of the work of several crews. The two fundamental questions on the suitability of any method are: (1) Does it accomplish effectively the work to be done?; and (2) Is it economical? Cincinnati has solved the problem. A sanitary engineer reported that collection costs are about 80 to 90 percent of the total cost for refuse service. The three basic methods of residential refuse collection are: curb or alley, backyard, or variations of these involving set-out or set-back by the householder. Backyard service is more convenient and aesthetic for the householder. College Park and Riverdale, Maryland have reported substantial savings with backyard collection of paper sacks. The equipment used for residential collection varies from small open trucks, still required for the collection of bulky items, to the new large compactor trucks, which reduce the number of trips required to the disposal site. A three-man collection crew for packer trucks is most economical. The basic types of commercial and industrial collections are listed. Transfer stations, in which the refuse from smaller collection vehicles is transferred into large bulk haulers for disposal, are increasing in use, particularly in California. Public health aspects and the types of collection agencies are discussed. Research in the field is in the area of systems analysis. One type of research needed is data collection, which is discussed fully.

65-0166
Trailers help to solve park refuse problem. American City, 80(8):158, Aug. 1965.

To solve its refuse collection problem, Salisbury Park, a 1,000-acre recreational facility in East Meadow, Long Island, uses rubber-tire mounted Dempster Container Trains. This is necessary, since trucks could not reach many areas because of narrow trails and delicate playing turf. The trains, towed by soft-tire tractor, can travel over delicate playing-field sod and into hard-to-get-at places. To give this system added flexibility and bigger over-all capacity, larger capacity-fixed containers were placed at major accumulation points where they were accessible to the Dempster-Dumpmaster self-loading packer. The system of 35 containers, fixed and mobile, and the one large packer truck has reduced manpower; more than two-thirds of the former refuse collection and clean-up crews could be shifted to other types of work.

65-0167
Truck loader lifts 3600 pounds in beach cleaning operation. Refuse Removal Journal, 8(5):26, May 1965.

The 1965 model Beach Sanitizer, powered by a tractor, can hydraulically lift and dump up to 3,600 lb of debris directly into a truck or trailer.

65-0168
Versatile machine for Barking. Public Cleansing, 55(3):140-141, Mar. 1965.

A modified truck now in service in Barking, England, can load and carry an abandoned or wrecked car, load and carry a standard 6 cu yd container, or transport small loading shovels and similar equipment. A brief description of the modified truck is included.

65-0169
A witch clears the harbor. American City, 80(10):62, Oct. 1965.

A new diesel-powered surface dredger, named the 'Liverpool Witch', is skimming floating debris from waterways with a hydraulic scoop that resembles those mounted on self-loading trucks. Three such vessels are cleaning up 37 miles of docks in Liverpool, England. Each of these units has the capacity to collect 50 ton per day. The 25 ft long craft can carry up to 1 ton of watersoaked debris in its tubular steel and mesh scoop measuring 10 by 4 by 4 ft. One of these dredgers cleared 3,000 sq yd of oil in less than 3 days after sawdust had been spread to absorb it. The vessel's 30 hp diesel engine supplies power for propulsion and for the hydraulic scoop. It cruises at 8 knots, and works at 4 knots.

DISPOSAL–General

65-0170
Angels adopt a mechanical goat. American City, 80(8):16, Aug. 1965.

The city of Anageim, California, will include a $50,000 refuse disposal mechanism which shreds, wets, and then squeezes a ton of trash per hr into 20 percent of the original bulk at the new baseball stadium for the California Angels. About 13,000 lb of refuse accumulate with each ball game.

65-0171
Answers from Mr. Archer. Public Cleansing 55(9):515, Sept. 1965.

Several questions posed at the 1965 Scarborough, England, conference on refuse disposal are answered. Screening of refuse before incineration, dependent somewhat on other factors, is not economical with less than about 25 percent dust. Multi-shift incinerator operation is generally feasible only in large, continuous-grate plants. Two hundred ppm sulfur content is average for British incinerator smoke.

65-0172
ASME annual meeting highlights--I. Combustion, 36(8):49-55, Feb. 1965.

Four papers presented at the ASME annual meeting in New York in Nov. 1964 presented the following problems: the need for a common base for evaluating efficiency, capital cost, solid combustible loss, and availability of refuse burning systems: the failure to utilize waste heat; the difficulties in conventional sludge heating systems; and the problem of burning rubbish and refuse in separate furnaces. The object is to present a summary of the results of papers presented at the meeting. The state of the art is indicated in regard to incineration and industrial wastes. In an attempt to provide a common basis of comparison of refuse burning systems, methods are established to determine the solid combustible losses for solid fuel units, the stack dust emission rates, and the recirculated system loadings. In the discussion of the utilization of waste heat from industrial sources, a boiler conversion is described which would permit the burning of liquid and solid wastes from consumer products as well as rubber chemicals and plastics, together with normal refuse, such as garbage, rubbish, paper, and wood. For a waste fuel-oil-fired steam-generator with 50,000 lb of steam per hr operating rate, the conversion cost would be $30,000. For heating sludge, the hot products of combustion from sewage gas are bubbled through the sludge. Burning of large stumps on a stationary grate while a flow of burning refuse is maintained past the object. New ideas in incineration were presented in these papers.

65-0173

Atomic blasts might help disposal, graduates hear. Refuse Removal Journal, 8(7):18, July 1965.

Richard Hamburger of the Atomic Energy Commission said that a nuclear explosion might be able to create an enormous cavity underground where millions of tons of solid or semi-solid waste could be disposed. He spoke before the graduating class of the solid waste course given by Rutgers University.

65-0174

Behrens, G. Experience in the maintenance and supervision of metropolitan waste disposal sites. Staedtehygiene, 16(10):230-232, Oct. 1965.

It is always rather hazardous to have waste disposal sites close to residential areas especially so if the waste is dumped into abandoned clay pits where the accumulating rain water cannot drain off. It mixes with the decomposition water of the waste instead, which is rich in hydrogen sulfide. Often the water flows in an open trench to the sewage canal annoying neighboring residents by its odors. Quite frequently measures were taken only after a number of complaints. By adding chlorine to the water in the pit the hydrogen sulfide is bound and the odor along the trench eliminated. Moreover the newly deposited waste should be immediately covered with soil. All waste disposal sites must also be fenced in and guarded to prevent habitual garbage collectors from removing partly usable material like furniture, clothing and half-perished food. Insects, rats, and birds that gather there in great numbers must be exterminated to prevent spreading of diseases. A new rat-killing poison will soon be on the market. It will be embedded in wax through which the luring odors can penetrate but which will not dissolve in the rain. (Text-German)

65-0175

Boettcher, F. 1965 water technological meeting in Goettingen. Wasser und Abwasser, 106(36):981-986, Sept. 1965.

The German Association for Gas and Water Control and the Association of German Gas and Water Companies held a meeting between March 11 and 13, 1965 in Goettingen, Germany. Among a number of papers presented which dealt mainly with drinking water, waste water, etc., one treated the dumping of waste and its influence on groundwater. It was stressed that, according to 1961 statistics, 97 percent of the entire waste accumulating annually in Germany is still dumped and that deposit sites must be found for 44 million tons annually. In most cases, not much attention is paid to where and how the waste is dumped. A considerable impairment of groundwater was discovered, mainly through the increase in mineral salt concentration. (Text-German)

65-0176

Braun, R. Technical terms and their explanation. In Refuse and waste disposal. Berlin, Druckhaus Lichterfeld GmbH, 1964.

A joint committee 'Definitions' of IAM and AKA have compiled the most important and most frequently used technical terms from the field of waste disposal and accurately defined them. The list is divided into eight sections in which the technical terms with their explanations are arranged in alphabetical order and numbered. A general alphabetical list of technical terms is provided, which should facilitate the use of the index. The eight sections are: general technical terms, hygiene and microbiology, planning and economy, collection and removal, sludge treatment, dumping, composting, incineration, and operating and administration.

65-0177
Bredar, W. L. Denver's Metro waste treatment plant. Civil Engineering, 35(12):64-66, Dec. 1965.

The new Metro Plant will cost $17 million and is designed to handle the expected growth through 1982 of all the member districts. The primary treatment capacity is 27 mgd to treat raw waste from the Clear Creek and the Sand Creek basins. The secondary capacity is 117 mgd to treat all primary effluents plus the effluent from Denver's existing primary plant. The activated sludge process will consist of thickening followed by vacuum filtration, incineration or drying. Extensive dewatering procedures required to permit construction on a 'wet' site are necessary. (The normal water table is only 11 ft below the surface.) Five thousand uplift piles have been used to anchor all deep structures. The entire complex consists of 14 buildings all faced with precast aggregate panels with porcelain trim. The Metro District, organized in May 1961, includes the City and County of Denver and 12 adjacent municipalities, covers 250 sq m with a population of 800,000, and an estimated population of 1.5 million by 1980. The Metro Plant was built by a board made up of one member from each municipality for each 25,000 of population and provided that no municipality may have more than 50 percent of the total membership. At present, there are 26 members, 13 from Denver and 13 from the other 12 municipalities. A bond issue of $32.5 million approved in 1962 is secured by revenues anticipated from the plant's operation. The technical details of the construction, the uplift piling, the use of the critical path method in the design as well as in construction, are all described in some detail. The major suppliers of equipment are listed and the treatment processes outlined.

65-0178
Bustamente, R., H. Davis, and E. C. Fox. Determining the BOD loading from a zoo. Public Works, 96(2):121, Feb. 1965.

A Tulane University research project undertook the determination of zoo animal waste organic loadings. The primates tested included two Bengal tigers, a leopard, a cheetah, two lions, a Kodiak bear, a sun bear, a rhesus monkey, and a dog-faced baboon. All were males, except one of the tigers and the cheetah. The female tiger was a cub and the rest were adults. The sampling was for fecal matter only. Each sampling represented a 24 hr accumulation. The analyses consisted of a weight determination and a 5-day BOD. A possible error in weight determination might have resulted from evaporation, the cages being open to the weather. To determine BOD 10 g of each specimen were thoroughly mixed with 1000 ml of distilled water, providing a dilution of 1 percent. The results were tabulated. The BOD of the feces of the feline animals ranges higher than those of the primates and bears. The figures, pounds of BOD per lb of animal, show good correlation with each other and with human waste. Considering the generally used design factor of 0.17 lb of BOD per person and an average weight of 150 lb, the parameter would be 0.00113 per lb. The tests were admittedly inconclusive in some respects, with urine sampling omitted and solid content not fully determined.

65-0179
Carmichael, W. World's largest cleansing department. Public Cleansing, 55(2):69-74, Feb. 1965.

The activities of the Tokyo sanitation department presently serving 10 million people are described. The central authority for this department receives about $50 million per year, 4.1 percent of the municipal budget. Presently, 2/3 of the raw refuse is landfilled on an island site, and 1/3 is incinerated in 9 plants in the city. Because of landfill site scarcity, the city will be building 10 new plants before 1970 to incinerate all of its 900 ton per day refuse collection. The sanitation department also empties cesspools at night, as only 25 percent of the homes are on sewer lines. Mention of Olympic games cleaning procedures is made. Street cleaning is done by 1,100 manual laborers paid at about $1.40 per day. The department has good techniques and will eventually match those of other large cities.

65-0180
City waste treatment facilities still needed. Western City, 41(10):55, Oct. 1965.

According to Richard Pickard, chairman of the Conference of State Sanitary Engineers, there are 5,277 communities which need municipal waste treatment works. The population of these communities dropped from 36.7 million in 1964 to 33.2 million in 1965. There are 1,342 communities (pop. 11.3 million) discharging untreated wastes into streams, 1,337 communities (pop. 16.8 million) discharging inadequately treated wastes, and 2,598 towns (pop. 5.1 million) in need of sewage collection facilities. The construction costs are estimated at $1.86 billion but to eliminate the backlog, the annual level must rise to $865 million. In 1964, municipal construction amounted to $590 million.

65-0181
Connel, J. M. Solving two major problems of a modern city: a combination garbage disposal-desalination unit. Heat Engineering, 40(5):64-71, Sept.-Oct. 1965.

Foster Wheeler Corporation's concept envisages the disposal of municipal refuse in a water-cooled incinerator and the use of the steam produced from this process as a 'free heat' source for the flash evaporation of the seawater which is found in close proximity to most large cities. The plant cycle is shown on an accompanying schematic diagram and indicates the principal equipment necessary in the overall complex. Each refuse disposal unit is capable of completely burning 400 ton per day of municipal refuse and generating 120,000 lb per hr of steam. Large particles of fly ash will be caught in the boiler hoppers, but the insidious fine dust is removed within the electrostatic precipitator. A pictorial representation is presented of a thirty-two stage, 5 million gal per day flash evaporator. The evaporator converts sea water into fresh water by causing the sea water to absorb heat while flowing within tubes and then allowing some of that water to flash into steam from a pool while under vacuum. Minute salt particles remain within the pool, while steam condensing on the outer surface of the tubes and raining into the trays is pure drinking water. Installed capital costs of the complete plant with an operating personnel of 48 is estimated at $9,700,000. The operating costs of refuse disposal are estimated at $2.24 per ton based on 800 ton per 24 hr day for 335 days per year. Potable water production operating costs will be $.324 per 1,000 gal based on a production of 5 million gal per day for 350 days.

65-0182
Davies, A. G. The American way of cleansing life. Public Cleansing, 55(2):93-94, Feb. 1965.

Several aspects of American solid waste disposal are briefly examined from a British viewpoint. The general level of facilities in America was not thought superior to those in England. The American refuse was credited with a higher percentage of combustibles with less ash, which favored incineration, than England. No standardization of vehicles or methods was noticeable in the United States. Some open dumps were still used, but much sanitary landfilling was done, even next to drive-in theatres situated on top of completed fills.

65-0183
Drobny, N. L. Survey of Antarctic water supply and waste disposal facilities, practices, and problems. Technical Note N-708. Port Hueneme, Calif., U.S. Naval Civil Engineering Laboratory, Apr. 1965. 24 p.

A survey of water supply and waste disposal problems at existing U.S. Stations in the Anarctic is presented. Problem areas are identified, and potential research and development efforts are suggested. Large, small, and inland stations are examined. At McMurdo, a large coastal station, the disposal of human waste and garbage is extremely primitive; 'honey buckets' are used and emptied in the bay. The construction of a conventional community liquid water distribution and water-carriage sewage collection system is planned for this station. Waste disposal at Williams Field and Hallett Station also used a honey bucket system but no specific improvements are recommended since these two stations are quite small. The South Pole inland Station uses 5-gal flush-type toilets. The waste water from these units along with that from the urinals and washing machine is discharged into a pit in the snow. Other inland stations also discharge waste to snow. Problems are associated with the disposal of solid waste to the surrounding snow such as: health hazards; loss of structural support due to the creation of large below-grade cavities; and contamination of the snow environment. A minimum flush toilet is recommended for these inland Stations.

65-0184
Duckworth, S. The meterologically scheduled open burn. Journal of the Air Pollution Control Association, 15(6):274-277, June 1965.

The feasibility of scheduling open burning (such as that now prohibited under Regulation I of the Bay Area Air Pollution Control

District at San Francisco) under selected meteorological conditions is discussed. Tables given include various indicators of pollution potential and a theoretical calculation of airborne particulate material in half-plume cross-section at two downwind distances. A photograph shows the effects of firing a poorly stacked 40-ton pile of debris. One graph shows a mathematical estimate of visibility reduction from the open burning of 28 tons of brush at various distances. The latter shows an opaque plume at 300 ft and a Ringelmann No. 1 at 2,000 ft. Another plot shows the fallout pattern isopleths from the open-burning of 300 tons of land-clearing debris. Requests for variance from Regulation I have been based on the applicant's willingness and his consultant's ability to schedule a proposed open-burn under meteorological conditions favorable for the dilution and travel of the resulting airborne pollutant cloud. Meteorologically scheduled open-burning offers a feasible way for single disposal of land-clearing debris under the following conditions: the economic saving is large and other methods of disposal are not readily available, the site is remote from populated areas, the debris is dry, well-stacked, and fired in competent supervision, and the community is willing to accept the esthetic loss on the day of the burning.

65-0185

Dump owners move to cut air pollution. Refuse Removal Journal, 8(6):32, June 1965.

An East St. Louis city engineer reported that some industries have held up plant expansion in an area north of the city because of the smoke nuisance from burning refuse at six open dumps. The open dump operators, whose burning is charged with adding to air pollution, were ordered to extinguish their fires and find more suitable refuse disposal methods. Representatives from five of the six operations are taking steps to end the fires and comply with the Illinois Air Pollution Control Act. A preliminary hearing found the dumps were contributing to air pollution and they were ordered to halt burning. Later the board granted an extension until more hearings were held. Since then, health officials have observed dense smoke coming from all the dumps. Two of the cities involved have studied the feasibility of an incinerator as a joint venture, whereas another city intended to use sanitary landfill because it could not afford the $350,000 needed for an incinerator. Two of the three private dump operators explained that they had just purchased equipment which would allow them to begin sanitary landfill operations, and thus comply with the order.

65-0186

Dump smoke causes asthmatic outbreak. Refuse Removal Journal, 8(1):28, Jan. 1965.

Smoke from an abandoned city dump burning underground was the first air pollutant linked to asthmatic outbreaks in New Orleans, Louisiana. The dump is located in the north-east section of New Orleans, one of two regions of the city specified as probably emanating points of air pollution. A poor combustion product containing silica was found to be present in increased concentrations when peaks in asthma attacks occurred. Skin tests using smoke extracts produced a very high incidence (83%) of positive reactions among victims of previous outbreaks. The outbreaks are associated with low velocity winds coming sometimes from the north and north-east.

65-0187

Dunkers, K., and W. Schwalbenbach. Experiments on dehydrating material retained on a trash rack at the purification plant Akeshov, Stockholm. Staedtehygiene, 16(9):193-196, Sept. 1965.

Experiments with a special type of press were conducted for dehydration of material retained on a trash rack at a purification plant. The material had a high water content (about 87%) and was thus difficult to transport to a composting or incineration plant. The press which was used for dehydration consisted of two plates which were operated by two separate hydraulic cylinders. After a compacting period of about 2 minutes the press plates were removed automatically and the dehydrated material fell into a bag. The weight was reduced by 67 percent and the volume by 80 percent. An automatic packing machine was attached to the press which wrapped the dehydrated and compacted material. The water left over from the pressing process was returned to the purification plant. The compacted material had a solids content of 40 percent in contrast to 13.3 percent before treatment. Illustrations of the press and the wrapping machine are given. (Text-German)

65-0188

Effect of solid waste dumping on surface and underground water. Public Cleansing, 55(10):575-576, Oct. 1965.

A summary of Dr. Ing. Wilhelm Langer's paper presented at the 1965 Third Congress of the International Research Group on Refuse Disposal at Trento, Italy is presented. Types of water infiltration of solid waste dumps are discussed. General and bacteriological pollution and factors determining their persistence in the water supplies are also presented. Testing for and determining amount of pollution is explained, and also ways of preventing pollution.

65-0189
Eldredge, R. W., and H. J. Dominick. 1963-1964 Refuse disposal study, Winnebago County, Illinois. [1965] 39 p.

Winnebage County, Illinois is about 91 miles northwest of Chicago. Rockford, the county seat, is an industrail city employing most of the residents of the County who are employed in manufacturing activities. By 1970 the population of the County may be about 300,000 with Rockford having about 200,000. The problem of refuse disposal is compounded not only by the rapid increase in household units but also by the increasing amounts of refuse generated by each unit. The present study describes the methods of refuse disposal, gives a brief history of Rockford's refuse disposal, evaluates the existing solid waste disposal facilities in the County, and investigates possible ground water pollution by sanitary landfills. Conclusions and recommendations are given in the Introduction. There is a 10-item bibliography on page 39.

65-0190
Eldredge, R. W., and H. J. Dominick. Introduction. 1963-1964 Refuse disposal study, Winnebago County, Illinois. [1965]. p.1-3.

Winnebago County, Illinois is about 91 miles northwest of Chicago. Rockford, the county seat, is the largest city and by 1970 may have a population of 300,000. Although 83 percent of the County is farm land, 64 percent of the population now lives in Rockford. The problem of refuse disposal is increased by the growing population and the additional amounts of refuse generated by each individual household. The conclusions and recommendations resulting from the entire study are summarized in the Introduction. Adequate landfill sites are needed within easy hauling distance of all portions of the County. Incineration should be considered when landfill sites become more difficult to obtain. A registered professional engineer should design sanitary landfills after thorough study of the site to assure adequate safeguards to prevent saturation of the fill either by percolation or intimate contact with ground water. Consolidation of landfill sites on an area-wide basis would produce economies in operation. The County should establish criteria to guarantee the minimum public health standards establish by the State after the elimination of open dumps.

65-0191
Eldredge, R. W., and H. J. Dominick. Alternative methods of refuse disposal. In 1963-1964 Refuse disposal study, Winnebago County, Illinois. [1965] p.4-15.

Six methods of refuse disposal, their limitations, advantages, and disadvantages, are discussed and their use in Winnebago County cited. Garbage, which accounts for less than 15 percent of the total refuse generated, may be disposed of by feeding it to pigs. All states require that such garbage be cooked to destroy the virus of Vesicular exanthema and this requirement has reduced the economic advantages of feeding garbage to hogs. There are no known piggeries in the County. Open dumping is the most usual method of solid waste disposal in the County. Some are periodically consolidated and compacted and are therefore less objectionable than those not maintained regularly. Open dumps in urban areas can be converted to sanitary landfills to reduce nuisances, eliminate public health hazards, and improve the appearance of the site. The public, unfortunately, associates all disposal operations with open dumps, and this makes it difficult to get sites for sanitary landfills. Sanitary landfills are economical, with low initial investment and with operating costs one-third to one-hald in the cost of incinerating. They are flexible to adjust to changes in population and in kinds of refuse. If refuse has been collected separately from garbage, sanitary landfill operation will permit combined collection with resultant lower costs. The length of haul can be reduced since sanitary landfills can be close to populated areas without nuisance. Sub-marginal land can be reclaimed and used for airports, parking lots, parks, playgrounds, etc. The hazards of open dumps are eliminated. The operation of a sanitary landfill is described and the disadvantages listed. The advantages and disadvantages of incineration are listed and costs given. Composting and on the site disposal (garbage grinding) are also discussed.

65-0192

Eldredge, R. W., and H. J. Dominick. Brief history of refuse disposal for the city of Rockford. In 1963-1964 Refuse disposal study, Winnebago County, Illinois. [1965]. p.15-17.

In 1945, Rockford, Illinois, which was then a city of 90,000, had 196 cases of polio and 14 deaths. A public demand arose for the abandonment of the private contract method of collecting refuse with open tarpaulin-covered trucks, disposing of garbage by feeding it to hogs, and disposing of other solid wastes at an open dump. A bond issue for about $250,000 was approved and a survey made of methods. This report, dated October 1, 1946, is quoted at some length. Sanitary landfill was suggested as the best solution.

65-0193

Eldredge, R. W., and H. J. Dominick. Appraisal of existing Winnebago County solid waste disposal facilities. In 1963-1964 Refuse disposal study, Winnebago County, Illinois. [1965]. p.17-20.

Visits were made to all the disposal sites in the County and the technical details of the present operation are reported. Recommendations and suggestions are made. For example: the Rockford Land Reclamation Site serves the City of Rockford by contract collection and is available, on a fee basis, to other haulers. The sanitary landfill is maintained in better than average condition. The incinerator's small capacity makes its operation uneconomical. The City of Rockton operates a dump on the South Bluff Road between the road and the Rock River. Garbage is disposed of at the toe of an open dump face. This is an eyesore and public health hazard. The dump should be compacted and convered. Eight such sites are described in this manner and the characteristics of each set forth.

65-0194

Eldredge, R. W., and H. J. Dominick. Possible ground water pollution by sanitary landfills. 1963-1964 Refuse disposal study, Winnebago County, Illinois. [1965]. p.21-28.

The Illinois State Geological Survey has prepared a report using studies of the geology of Winnebage County, boring records, water well records, and the general knowledge of staff members as to the geology and geomorphology of the area. The report leaves some doubt as to the practicability of constructing sanitary landfills anywhere within the county. Of the eight refuse disposal sites now in use not one is located in areas indicated as favorable by the Survey. Only two provide cover material that in any way diverts surface water. Six have no barrier to water absorption, percolation, and possible water pollution. Two sites have municipal wells on their periphery. Both wells were drilled with the knowledge of the disposal site's existence. The apparent indiscriminate location of refuse disposal sites has not resulted, paradoxically enough, in widespread complaints of water pollution. Perhaps too much stress has been put on the underground pollution potential. Adequate safeguards are necessary, however, to protect the underground water supply.

65-0195

Ellis, H. M. Influence of dumps of solid domestic and industrial refuse on surface and underground water - British research and practical experience. Public Cleansing, 55(6):378-380, June 1965.

Results of experiments on water pollution from wet and dry refuse dump pits are explained. The dry dump, with 90 tons of refuse dumped 5 ft deep and covered by 1½ ft of top soil, was observed for 2½ years under a rain fall of about 25 in per year. A high degree of pollution in the percolate was measured for the first 12 months, after which contamination rapidly decreased. One hundred tons of loose refuse was wet-dumped intermittently over 15 months in a pit of tap water. Bacterial pollution was originally very high, but for successive dumps the heavy initial pollution of various types created anaerobic conditions which lowered bacteria concentrations. The results of the experiment led to careful selection of dumping sites, and construction of a purification system for effluent from the site, using settling tanks, hydrated lime, percolation, filtration, and aeration methods together.

65-0196

Erhard, H. History of city sanitation. In Refuse and waste disposal. Berlin, Druckhaus Lichterfeld GmbH, 1964. p.1-11.

The problem of waste disposal first arose when man gathered into tribes in the Indus Valley managed to solve waste disposal effectively. Excavations of Mobondscho-Daro and Harappa have revealed a remarkably high level of residential culture. Clay pipes with flanges led the domestic sewage to a main sewer in the street which was covered with bricks or stone plates. Greeks and Romans also had water and drainage systems. In 1609 the municipality of Paris introduced a street-cleaning service whose costs were covered by public funds. One of the indisputable achievements of the British was their realization of the relationship between hygiene and martality. It was only in the 20th century that deveoopments took on a systematic character. Street cleaning was mechanized to an increasing extent. The first garbage incinerator was constructed in 1976. In England, where the garbage had a high calorific value, incineration presented no particular problem so that the number of towns that chose this method rapidly increased. On the continent, the first incinerator was built in Hamburg in 1893. Composting the oldest process known for the agricultural utilization of urban refuse is also discussed.

65-0197

Fairlie, P. D. So much rubbish. Public Cleansing, 55(3):149, Mar. 1965.

The contents of ordinary waste paper containers have changed significantly in the past few years. Not many years ago 70 percent of household refuse consisted of dust and ashes. The change over from single dwellings and household fires to complex apartments with central heating has changed the composition of waste to substantial amounts of metals and bottles as well as the paper or cardboard refuse used in packaging. New packaging materials, such as plastic, have created a serious problem of disposal as they do not burn down, decompose, or have any use in composting. As a result of these changes, the bulk of refuse has increased by at least 50 percent, leaving officials with two major problems: (1) the disappearance of dumping sites, and (2) the difficulty of obtaining proper decomposition results. Possible solutions for these waste disposal problems include incineration and salvage operations.

65-0198

Garrett, R. Refuse reflections, Public Works, 96(12):128, Dec. 1965.

Refuse disposal has been one of the most difficult municipal problems because of a tendency to delay a decision as to which is best: controlled, open-burning dumps, sanitary landfills, composting plants, or incineration plants. A temporary method only delays and makes more difficult the final decision. The 'open dump' is not advisable, although 25 percent of American cities still make use of it. It is a smelly, smoky eyesore that decreases land values and creates nuisances. It is a breeding ground for rats, insects, and isease. Although it was the first convenient means of refuse disposal, it should not be considered in view of the present disposal crisis.

65-0199

Hart, S. A. Our wastrel world. Agricultural Engineering, 46(12):684-685, 691, Dec. 1965.

The wastes created by society and their disposal are discussed. Two ways to dispose of wastes are: (1) conversion into usable material, for example, using manure as fertilizer; and (2) by discharge into the environment. Pumping sewage (either treated or untreated) into a river is an example of the second method. Making wastes less noxious before discharge into the environment is not sufficient. Our rapidly expanding population, our increased per capita volume and strength of wastes, and our increased fastidiousness and demand for more pristine surroundings, all demand that we do more than merely dump wastes. We must evolve schemes for the conversion and utilization of wastes. The fragmentation of wastes production, wastes management, and wastes discharge, is a most serious impediment to solution of the total problem. The waste problem will not be solved by such an approach. Solution will come only through consolidation of attack and attitude on the total but diverse wastes of the whole society. Liquid, solid and gaseous wastes from agriculture, industry and the municipality, and their insult through discharge, or conversion, upon the environment resources of land, water, and the atmosphere, must be integrated. We are approaching an era when management science will be an equal partner in the solution of wastes problems. Computer techniques will be used to determine what wastes need to be treated in what manner and to what degree, and what share of the total pollutional burden can be shared by the land, water, and air resources of a community.

65-0200

Jager, B. Types of waste. In Refuse and waste disposal. Berlin, Druckhaus Lichterfeld GmbH, 1964.

Types of liquid waste are discussed including domestic sewage, domestic sewage sludge, sewage from trade and industry, sludge from trade and industry, oil-containing residues, and radioactive residues. Types of solid waste are discussed including domestic refuse, refuse from trade and industry, waste from cattle yards and slaughterhouses, street litter, other refuse, and radioactive waste. When industrial sewage residues are precipitated together with domestic sewage sludge, they may greatly disrupt further treatment of the sludge due to their special physical or toxic properties. When radioactively contaminated residues are deactivated, concentrates requiring special treatment are formed.

65-0201

Jersey to smother 7-year dump fires. Refuse Removal Journal, 8(6):20, June 1965.

A golf driving range in the meadows near Rutherford, New Jersey, had to issue 'smoke checks', similar to baseball rain checks, because smoke and fumes from nearby dumps drove patrons off the range. Now, the smoldering fires in the East Rutherford flat lands opposite New York City that polluted air since 1959 have been snuffed out. The State of New Jersey allocated $10,000 for the task, which could not be accomplished with municipal heavy equipment, such as bulldozers and fire trucks because of the marshy land. The job was tackled with only hand labor using water, bicarbonate of soda and clean landfill. Many of the fires burned underground, fed by repeated applications of flammable landfill. The smoke and fumes would offend the eyes and noses of area residents and would often combine with morning fog to bring commuting traffic in New York City to a standstill.

65-0202

Johnson, L. B. Natural beauty of our country. H. Document No. 78, Congressional Record--House. Feb. 8, 1965. 12 p.

Continuing technological progress and improvement in methods of manufacturing, packaging, and marketing of consumer products has resulted in an ever mounting increase of discarded material. We need to seek better solutions to the disposal of these wastes. The President recommended legislation to: assist the states in developing comprehensive programs for some forms of solid waste disposal; provide for research and demonstration projects leading to more effective methods for disposing of or salvaging solid wastes; launch a concentrated attack on the accumulation of junk card by increasing research in the Department of the Interior leading to the use of metal from scrap cars where promising leads already exist.

65-0203

Katz, P. Problems of waste disposal in the area of Basel, Switzerland. Schweizerische Bauzeitung, 83(25):437-447, June 24, 1965.

There are mainly three methods for eliminating the various kinds of waste such as household wastes, industrial waste, sludges, slag, rubbish, etc. Orderly dumping is one method but it is now more and more restricted by hygienic regulations. Dumping into abandoned gravel or sand pits is prohibited. A layer of clay, at least, must seal off the decomposition water from the groundwater. Every load of waste dumped must be covered with a layer of soil or sand. Another method is composting which converts organic wastes into humus. The composting process takes place either in rotting beds or in tanks. The waste layers have to be turned over frequently. Whether rotting in tanks is a faster process is still a controversial issue. The third method of waste disposal is incineration. The great number of incinerators now available can be classified according to size, or type of grate, or continuous or discontinuous operation. There is no unique answer to the question of advantages of incineration over composting. In Switzerland incineration is preferred since compost has only a limited market. None of the methods can ever be considered as profit-gaining business. The elimination of waste must be viewed rather as a hygienic and aesthetic task which must be solved as economically as possible. The waste disposal situation in and around Basel, characterized by an acute shortage of dumping sites, is discussed in great detail. The problems are compounded by large quantities of industrial waste from the local chemical industry. A new incinerator plant for 600 tons per day (1,200 at a later stage) is in the planning stage. Its layout is illustrated and a detailed description of its construction is given. The plant will serve 44 communities in Switzerland, France and Germany. Heat will be supplied to a remote-heating system. (Text-German)

65-0204

Kaupert, W. Third conference of the International Work Group for Waste Research. Staedtehygiene, 16(10):233-236, Oct. 1965.

The third conference of the International Work Group for Waste Research, held May 24 to 29, 1965, in Trient, Italy, was concerned with sanitary landfill, methods for cleaning flue gases escaping from incinerators, crushing of waste, and composting. A delegate from the Netherlands reported on experiments with a two-stage composting method. In the first stage the material is spread over rotting beds only 45 cm in height where a rotting process by mold fungi takes place. A 3 to 4 week period of post rotting follows. A delegate from Geneva, Switzerland, discussed the odor problem in the composting process. After a number of experiments it was found that the best solution is filtration through the soil. Sandy soil proved to be better than clay. In conclusion, the sewer sludge problem and waste elimination in Italy were depicted. Italy is presently at the stage of introducing sanitary landfills. (Text-German)

65-0205
Location of refuse disposal sites. Wasser und Abwasser, 106(8):233, Feb. 26, 1965.

This is a report on an article by F. Heigl (Informationsblatt, No 22, International Arbeitsgemeinschaft fur Mullforschung, IAM, Zurich). Refuse disposal sites must be carefully selected in order to avoid pollution of the groundwater. Diluvial and alluvial sediments are unsuitable for dumps. Investigations in the area of the Traun river, Austria, showed that a groundwater current of several Kilometers in width flows parallel to the Traun with only a speed of 1.2 cu m per second while the annual precipitation is 6,000 cu m per hectare of 0.2 liters per second. Although a considerable amount runs off on the surface, enough water penetrates, carrying with it traces of organic substances which are sufficient to spoil the groundwater. Drainage, filtration, and other modifications of disposal sites are briefly discussed, as is the location of wells. (Text-German)

65-0206
McCarthy, F. Public cleansing in Great Britain. Public Cleansing, 55(5):300-312, May 1965.

A paper presented by the president of the Institute of Public Cleansing in Britain to the American Public Works Association on general British refuse disposal services is reported. It describes the criteria for the changing pattern of British Local government to regional councils of larger area, explains the training necessary for executive cleaning positions, relates services of the Cleaning Institute, and gives an analysis of British refuse, pre-war and present, explaining present high paper and metal can rate and power cinder content. The standard for collection systems are expendable or easily-cleaned receptacle, and refuse covered from home to dump site. Although presently galvanized steel cans with detachable lids are used, the more hygienic dustless and paper sack system are gaining favor. Plastic containers are also being tried because of cheapness, lightness, and quiet operation. About 80 percent of Britain's refuse is placed in sanitary landfills, 16 percent is incinerated, and 4 percent composted. Increasing haul length of 15 to 25 miles has brought emphasis on incineration. A variety of transfer stations are discussed including the MPL system with static ram compressors and loader. Comments on composting, on-site disposal, street cleaning, the Garchey system, and gully emptying are included. Continued progress in Britain's public cleansing field from larger authority, higher standards, research, increased mechanization, and land shortage is expected.

65-0207
McKinney, R. E., and H. H. Benjes. Evaluation of two aerated lagoons. Journal of the Sanitary Engineering Division, American Society of Civil Engineers, 91(SA6):43-55, Dec. 1965.

One new wasterwater treatment system that has been developed and is currently being field tested is the aerated lagoon. Originally the aerated lagoon was tested on industrial wastes. The results indicated that it should have value in treating domestic sewage. This study was carried out to evaluate the usefulness of aerated lagoons in treating domestic sewage. It was necessary to measure the flow on a continuous basis, the power used, the influent and the effluent characteristics, and the mixed liquor characteristics. The operational data include 5-day BOD uptake rates. Regular microscopic examinations were made to determine the nature of the microorganisms in the systems. Basic theory indicated that aerated lagoons could operate either as a completely mixed biological system, lending itself to a relatively simple mathematical analysis or as an incompletely mixed system which defies any simple mathematical analysis. The most efficient lagoons systems studied required from 1/5 to 1/4 hp per 1,000 cu ft to create complete mixing. It appears that the oxygen transfer characteristics of the mechanical, turbine aerators do not warrant design beyond 1.5 lb oxygen mg per liter. The aerated lagoons yielded 63 percent BOD reduction with 1.7 days aeration system should yield better than 50 percent BOD decreases as the temperature decreases, with lower treatment efficiencies in the winter.

65-0208

Master plan for refuse disposal. Public Cleansing, 55(10):570, Oct. 1965.

The 20 year disposal plan of Orange County, California, is outlined. Presently over 700,000 people produce 2,300 tons of refuse daily, and an estimated 2,000,000 people will produce 4,500 tons per daily by 1980. Disposal is at 3 landfill sites, with about 1/3 of the refuse passing through the 3 transfer stations. Disposal cost is about $0.70 per ton.

65-0209

Ostertag, H., and W. Junghans. Use and elimination of disposable linen in hospitals and convalescent homes. Staedtehygiene, 16(10):213-218, Oct. 1965.

Disposable linens and diapers are very reluctantly used because of the high costs involved. Their price is about 2 or 3 times as high as that of the conventional washable and re-usable linen. However, they are more hygienic and they relieve the nurses of their most unpleasant work, especially since the introduction of Moltex diapers. The used disposable linens are collected in large paper bags, together with the other hospital wastes, and are incinerated. The danger of spreading infectious disease would be too great if they were dumped. The wet diapers and those containing excrements posed some incineration problems since they did not fully burn down. Experiments were done in a pyrometric cone incinerator to find a method which would thoroughly burn this type of waste. The full paper bags were loaded into the incinerator one by one at intervals of 1 to 3 minutes at a temperature of 800 C. The incineration process was observed through observation ports in the furnace wall. The waste burned down fully and the ash residues consisted only of metal and glass components. The construction of the furnace is described in detail. (Text-German)

65-0210

Out-of-staters drop 9,000 yards per day. Refuse Removal Journal, 8(1):27, Jan. 1965.

About 400 refuse collectors from New York dump their refuse in New Jersey. New Jersey's dumping sites are popular because New York raised its dumping fees.

65-0211

Refuse analysis at Middleton. Public Cleansing, 55(12):683-685, Dec. 1965.

A detailed, tabled analysis of refuse from homes of different classes in Middleton, England is presented. Refuse content and densities are analyzed in the tables according to class of homes. Full incineration is being contemplated due to the grave shortage of landfill space within the borough.

65-0212

Refuse disposal at the source. Public Cleansing, 55(1):12-13, Jan. 1965.

The English ministry of housing is examining on-site disposal and reduction methods for multiple dwellings. A letter from the head of New York's Department of Air Pollution is quoted in part. It recommends the use of larger, more efficient municipal incinerators instead of the small, poorly operated and maintained, hard to staff, on-site incinerators.

65-0213

Rich, L. G., W. M. Ingram, and B. Berger. Waste disposal on space craft and its bearing on terrestrial problems. Public Health Service Publication No. 999-WP-29. Cincinnati, U.S. Department of Health, Education, and Welfare, Aug. 1965. 14 p.

Manned space missions of extended duration will require regenerative systems that provide the physiological necessities of man. There must be a utilization of waste products in a regenerative process. Solid and liquid human wastes will be processed to provide inorganic nutrients for the photosynthetic component of the system. Two processes hold particular promise for this purpose. One is wet combustion, which is an oxidation under pressure of organics in a water solution or suspension. Oxygen would be supplied by the injection of compressed air. The other process would be an aerobic, thermophilic, microbiological process. It would be continuous and completely mixed. A large recirculation ratio would be used, and the microorganisms in the recirculated flow would be destroyed thermally. This process could have application in many other fields. Tables, charts, and mathematical formulas support the facts presented.

65-0214
Rickles, R. N. Waste recovery and pollution abatement. Chemical Engineering, 72(20):133-152, Sept. 27, 1965.

In the tragedy of the pollution of U.S. fresh water and air, industry is only one of many contributors, such as outdated municipal sewage systems, automobiles, incinerators, generators, and the economic advantage of dumping wastes directly rather than using waste recovery methods. The techniques of waste treatment which are available are described on the premise that in the near future, antipollution regulations will make methods, which today are rejected because of expense, a necessity. General methods of treatment of liquid and gaseous wastes and techniques for separation of solids are discussed. Special problems of the chemical process industries and the disposal of chemical wastes are considered in detail with examples. The general approach to each of the problems is that the application of the method requires an understanding of the method, its limitations, and the nature of the waste. It is recognized that while some methods are suitable for recovery of waste products, many others are final disposal techniques which preclude recovery of any wastes except water and heat. The data included should be a guide to source material on governmental activities, the state-of-the-art, examples of techniques in waste disposal and recovery of by-products from industrial effluents.

65-0215
Shults, F. S. Refuse disposal: survey in prophecy. Public Cleansing, 55(1):39-62, Jan. 1965.

A survey of England's present solid waste disposal methods and a look ahead to future methods are presented. Long-range planning was cited as the key to efficient waste disposal. All refuse disposal is by either 'controlled tipping' (sanitary landfill) or by incineration. Trend in the characteristics of garbage is to lighter (about 300 lb per cu yd 25 years ago) and higher calorific value (presently about 6000 Btu per lb). Increase of hauling distances to 15 to 25 miles greatly increases disposal costs. Pulverization was considered only a half-measure, as it only reduces the volume. Composting was considered impractical because of trends towards lower percentages of compostable materials in refuse and a lack of market for the compost. Bulk haulage by road farther than 8 to 12 miles seems impractical. Haulage by rail or water has been little researched. On-site incineration was hard to control by untrained, part-time operators. Large initial investments for an overall cheaper per-ton disposal method were usually substituted by lower initial investments with higher per-ton disposal costs. Charts showing different cities' methods and disposal costs are included. The use of modern, moving-grate incinerators, coupled with power or steam production, for most municipalities on a regional basis, using skilled and semi-skilled labor is recommended. The use of sanitary landfills should be restricted to the more rural and county areas with suitable sites nearby.

65-0216
Solid wastes. In Restoring the quality of our environment. Report of the Environmental Pollution Panel, President's Science Advisory Committee. Washington, U.S. Government Printing Office, Nov. 1965. p.134-156.

The many problems of solid wastes are discussed. They include: sewage, trash and garbage, auto hulks, and demolition. The committee points out: (1) The magnitude of the problem with a statistical evaluation of all solid waste generated in the United States from 1959 to 1964; (2) The nature of solid wastes; the overall nature of the problem is such that attention should be given to (a) the improvement of organization and systemization of the waste material outflow portion of our consuming society, (b) the improvement of technology dealing with this outflow and with the separate steps of collecting, processing, and disposing, (c) the adoption of practices and policies that will close the loop between the materials consumption and the waste production parts of our society so that decisions relative to consumption will consider the waste product problem; (3) Salvaging and reclaiming; wastes of various types are recovered each year at an estimated value of five to seven billion dollars annually. Copper, lead, and aluminum as well as scrap iron are salvaged by the millions of tons each year; (4) Organization and sociological problems; there is a lack of awareness that extends from public leaders to our universities, of the intricacies of waste management problems. There is a large problem of local self-education; (5) Technology; recent potential improvements are cited, such as (a) sanitary landfills, (b) incineration, (c) composting, (d) water carriage of solid wastes, (e) compression and capillary drying techniques; (6) Automobile hulks; some research programs are in progress to find uses for auto hulks other than as scrap steel. Some possibilities are (a) design automobiles so they can be more easily cannibalized, (b) increase the interchangeability of automobile parts, so that the junk car might be cannibalized more rapidly for its parts, (c) improve the salvage process by a reversal of 'production line' technique, including the economics of super-scale entralized scrap yards, (d) consider the reconcentration of automobile hulks, in effect building an artificial iron mountain as a future resource, (e) institute a clean-up train which would collect, dismantle and compress junk cars in remote places.

65-0217
The sources of pollution. In Restoring the quality of our environment. Report of the environmental pollution panel, President's Science Advisory Committee. Washington, U.S. Government Printing Office, Nov. 1965. p.10-11.

The pollution sources, municipal and industrial sewage, animal wastes, urban solid wastes, mining wastes, consumer goods wastes and unintentional releases are described. Sewage effluents, whether or not treated, carry considerable quantities of phosphorus, nitrogen, and other plant nutrients and are a principal source of the damaging overfertilization of rivers, lakes, and estuaries. Excreta of farm animals are a major source of water pollution. Odor and fly problems arising from waste accumulations are acute in the feedlot of beef cattle and the mass production of poultry and are made more critical by encroachment of suburbs into what were farming areas. Estimated annual output of urban solid wastes, containing paper, grass and brush cuttings, garbage, ashes, metal and glass, is 1,600 lb per capita. Currently this means 125 million ton per year, whose collection and disposal costs about $2.5 billion a year. In the United States during 1963, more than 3.3 billion tons of waste rock and mill tailings were discarded near mine sites, also vast mountains of slag, ash, and other waste material. The billions of tons of consumer goods wastes are also discussed statistically, as are unintentional releases.

65-0218
Stirrup, F. L. Assessing disposal methods. In Public Cleansing; refuse disposal. Oxford, The Institute of Public Cleansing, 1965. p.11-15.

Disposal methods must be analyzed for their aspects. One must consider the composition of the refuse; technical resources and land available; dangers to health, waterways, fish hatcheries; amenity; future development; capital and operational costs; distance; and practical and economical utilization of materials. If near farming area, compost would be useable. Steel mills want scrap metal. Paper and fibreboard manufacturers can use refuse. It is important to consider extreme climatic conditions of heat, cold, rain, or fog.

65-0219
Stirrup, F. L. Refuse composition. In Public cleansing; refuse disposal. Oxford, The Institute of Public Cleansing, 1965. p.4-10.

In Great Britain domestic refuse in analyzed with the object of obtaining data as to yield, composition, and seasonal variation. The temperature and rainfall are recorded; the vehicle carrying test load is weighed. Refuse is passed through a screen to extract dust and cinder. The weight and percentage of each type of refuse is analyzed. Dust contains a small percentage of coal residue, but is mainly the result of complete combustion of solid fuel on domestic fires. It is largely mineral in character. Cinder is useful as a low grade fuel for heating installations. Vegetable and putrescible matter are used in compost preparation and for fertilizers. Paper can be recovered and repulped for use in manufacture of fibreboard and low grade paper. Metals are saleable. Rags may be sold for making new cloth, roofing felts or in linoleum manufacture. Glass must be well cleaned and sorted into white or colored to be saleable. Crude refuse has been used as a source of power. After treatment it can contribute to composts and land recovery.

65-0220
Straub, H. Amount and composition of solid waste. In Refuse and waste disposal. Berlin, Druckhaus Lichterfeld GmbH, 1964.

Sampling, sieving analysis, classification analysis, sampling for laboratory tests, determination of the moisture content, determination of organic compounds, equipment for mechanical analysis of refuse, preparation of laboratory samples for analytical examination, determination of residual moisture content, determination of the fuel value, self-heating tests, and determination of C/N ratio are discussed for determining the composition of solid waste. Instruction sheets are provided for determining the amount of solid waste. Composition of domestic refuse includes grain sizes, groups of substances, water content, organic and mineral substances, calorific value, and C/N ratio.

65-0221
Strict sanitation standards observed by ships at sea. Refuse Removal Journal, 8(2):6-7, 35, Feb. 1965.

Ocean-going vessels calling at U.S. ports from foreign countries are required to undergo a thorough quarantine examination by inspectors of the U.S. Public Health Service. The examination includes a check of storage and disposal of refuse. Continuous control methods are necessary for the handling of garbage and trash at sea.

65-0222
Supplement to Waste Statistics 1961. Wasser und Abwasser, 106(10):286, Mar. 12, 1965.

Upon request of the Federal Department of Health, Herr Ferber, Stuttgart, worked out a supplement to the statistics on waste disposal for 1961. Some of the particularly interesting results are: (1) Costs for the elimination of wastes are highest in Hessen and lowest in Wuerttemberg; (2) Complaints about being bothered by waste disposal are most frequently filed in Rheinland-Pfalz, Niedersachsen and Baden-Wuerttemberg; and (3) A tendency toward incineration of waste rather than composting is observed throughout Germany. (Text-German)

65-0223
Swiss Association for water and air protection. Schweizerische Bauzeitung, 83(12):204, Mar. 25, 1965.

At a meeting in Olten, Switzerland, on Apr. 9, 1965, three papers were presented: 'Water protection in the Kanton Solothurn' by L. Looser, head of the department of water protection of the Kanton Solothurn; 'Rubbish disposal' by F. Keller; and 'Complete elimination of solid and liquid waste' by E. Wylemann. A local incinerator plant was visited. (Text-German)

65-0224
Topics at Trento. Public Cleansing, 55(9):529-532, Sept. 1965.

The events and papers discussed at the International Research Group on Refuse Disposal, 3rd Congress, held at Trento, Italy, in 1965 are summarized. The outlines of the plants' operations are included. Papers on landfilling, pulverization, incineration, and composting were presented.

65-0225
Tornadoes in Midwest leave huge cleanup job. Refuse Removal Journal, 8(6):20, June 1965.

The tornadoes that cut paths of destruction across several midwestern states on Palm Sunday left in their wakes an enormous emergency cleanup operation, conducted by the National Guard, municipal and private contractors, and thousands of volunteer citizens.

65-0226
U.S. Department of Agriculture. Consumers all--the yearbook of agriculture 1965. Washington, U.S. Government Printing Office, 1965. 496 p.

This book reflects some of the facets of the Department of Agriculture's work in behalf of consumers and homemakers. It describes planting, painting, wiring, heating and cooling a house. A chapter advises proper disposal of waste and sewage treatment. Furnishing and interior work are discussed in the second section. Kitchen tools, cooking, refrigeration, dishwashers, waste disposers, incinerators, laundry, and handy tools comprise equipment described. Advice is given on finances: budget, mortgage, insurance, bills, etc. Accident prevention, health care and services are mentioned. Help in growing plants and landscaping is given. It describes composting and compost usage. Various activity suggestions are offered. Clothing selection and care and food selection and preparation are discussed.

65-0227
Vogel H. E. Pro Aqua III--international conference in Basel. Wasser und Abwasser, 106(30):847-848, July 30, 1965.

In March 1965, an international conference was held in Basel on 'Water and Air in Regional Planning.' One group of papers dealt with facilities and equipment for the elimination of special waste which cannot be handled by conventional rotting or incinerator plants. Noncombustible waste, poisonous and certain organic material like paints and plastics are best removed by controlled deposition. Certain combustible wastes can only be incinerated in special furnaces like rotating drums. Sintering at 1,300 to 1,500 C can convert poisonous metal containing inorganic sludges into depositable slags insoluble in water. A great problem is waste from the electroplating industry. A special central facility to treat these wastes was recently built in Southern Germany. (Text-German)

65-0228
Weston, R. F. laboratory waste disposal. Archives of Environmental Health, 10(4):550-553, Apr. 1965.

With the movement of laboratories to suburban and rural areas, special problems have been created by the limitations on waste disposal in areas where small streams are used for recreational or other high quality requirements uses. Adjacent land is not available for waste disposal, and air pollution is not permissible. Basically, the disposal problems are those of economically controlling the uses of air and water in such a manner that the quality changes involved in its use do not interfere with the welfare, rights, or economy of others and the uses of the land do not destroy its economical use by posterity. Practically every state and the federal government have passed laws on water pollution control. Fourteen states have some form of specific air pollution control legislation and 400 governmental units have varying degrees of smoke and air pollution control laws in their municipal codes. The federal program in air pollution includes appropriations to aid existing programs and to finance new programs for local communities. The bulk of the discussion is limited to water pollution. Laboratory wastewaters are a special problem, because, although they are present in small amounts, they can create serious pollution problems. Nuisance water pollution can be avoided by well planned in-laboratory controls, personnel education, adequate management interest and well-conceived treatment facilities. Successful disposal of laboratory wastes cannot be carried out without substantial cost and nuisance and must have full management support.

65-0229
Women voters tackle town's refuse dilemma. Refuse Removal Journal, 8(9):20-21, Sept. 1965.

A study on refuse disposal by the League of Women Voters of Summit, New Jersey, recommends that the town band together with neighboring communities to form an authority to operate an incinerator for refuse disposal. An alternative for refuse disposal is the sanitary landfill, but this method might be disadvantageous if operated in another county. The landfill currently used by Summit is in the nearby town of Miele, which has scheduled to bar outside communities from using it.

AGRICULTURAL WASTES

65-0230
Agricultrual wastes. In Restoring the quality of our environment. Report of the environmental pollution panel, President's Science Advisory Committee. Washington, U.S. Government Printing Office, Nov. 1965. p.10-11.

Farm animal excreta is a major source of water pollution, due to surface runoff or through seepage into waterways. Chickens are also considered in this report. Animal manure has been responsible for fish kills and is considered a health hazard to humans. There is a need for research to fine new uses and markets for farm wastes. The generation of manure from farm animals in comparison to humans is shown. There is a list of findings included.

65-0231
Clark, C. E. Hog waste disposal by lagooning. Proc. Paper 4567. Journal of the Sanitary Engineering Division, American Society of Civil Engineers, 91(SA6):27-41, Dec. 1965.

Because of the poor results obtained by the old standard of spreading hog waste on the land as fertilizer, lagooning was recommended, with 10 sq ft of lagoon area per hog. Believing lagooning to be a panacea, hog raisers built many new installations in Illinois. As the result of an excessively large number of complaints, several installations were visited in 1963, and a sampling program was undertaken which proved that the complaints were justified. Conditions observed in an operation installation are reported. The lagoons varied in size from 4 sq ft to 20 sq ft per hog. The lagoons produced a foul odor, were covered to varying depths with scum, and large, bursting gas bubbles were prominent. Five day BOD tests results were extremely erratic. The large amounts of antibiotics included in the feed carry over into the waste and have a marked effect on the bacterial population of the waste. Extremely high algal concentrations were found in the lagoons, which led to considerations of harvesting the algae for use as livestock feed. It was oncluded that the lagoon system succeeds in getting rid of the waste with the least expense and effort. Over the working life of the installation, the initial cost plus the cost of operation will amount to no more than pennies per animal served. Provided that the lagoon is properly located and constructed to prevent leakage to an aquifer, ground-water polllution is not a problem. Odors are adequately controlled, and no pests have ever been observed, an indication that the system is working satisfactorily.

65-0232

Clayton, H. J. Manure produces top contest corn yield. Compost Science, 6(1):29, Spring 1965.

Manure from 400 feeder cattle and 1,000 hogs supplied the nutrients for the top corn yield in Iowa's 1964 Master Corn Grower Contest. Raymond Keppy, who produced the top yield of 175.5 bushels of corn per acre, did not use any commercial fertilizer, but applied 18 to 20 tons of manure per acre before plowing. After plowing, the field was disked and harrowed and disked again ahead of the planter. Keppy farms 400 acres and follows a 7 year rotation of corn, oats, and meadow. Twenty tons of cattle and hog manure supplies the equivalent of 100 lb of nitrogen, 40 lb of phosphorus, and 160 lb of potassium. A total of 1,330 farmers completed the 1964 contest by selecting 5 acres for a yield determination.

65-0233

Hart, S. A., E. P. Taiganides, and H. J. Eby. Waste disposal....pre-eminent challenge to agricultural engineers. Agricultural Engineering, 46(4):220-221, Apr. 1965.

Highlights of a research session on agricultural wastes management at the 1964 American Society of Agricultural Engineers' winter of 1964 meeting in New Orleans are reported. Urban sprawl is forcing higher standards on agricultural sanitation. European waste handling techniques in populous areas will serve as helpful guides. More research on defining and characterizing agricultural waste is needed, as well as positive thinking to consider manure and other wastes as resources which can be used as fuel, algae production, fish culturing, and in coprophagy.

65-0234

Moorman, R. Controlling odors from cattle feed lots and manure dehydration operations. Journal of the Air Pollution Control Association, 15(1):34-35, Jan. 1965.

The control of odor in the growing cattle feeder industry is important if the operator wishes to avoid injunctions or nuisance suits. The growth of cattle and human population concentrations in the same general areas aggravates the problem. The odors in feedlots result from poor drainage, spilled feed, and improper disposal of carcasses, all of hich are the result of poor planning and/or poor management. The real odor problems originate with the accumulation and disposal of the manure in the feeding pens. The necessary regular removal program may be facilitated by black top or concrete floors. The satisfactory methods of disposal of the collected manure include properly constructed compost piles, dehydration, removal to a sparsely settled area away from potential complainers, and spreading on fields and plowing under. Where odor still persists, ground and air sprays have been tried with the preference for the ground sprays in the feedlots. The use of manure dehydrators is increasing as it provides a means of extending the market to areas not available for the green or bulk composted manures. The dehydrator should be well-designed and have careful control of the product flow. Odor control becomes important to the dehydrator operator not only during the process, but in the storage prior to dehydrating. In addition to the use of odor counteractant sprays, dust collectors are required and odor counteractants are indicated for the finished product. Odor control from cattle feedlots is practical if the management is willing to make the effort.

65-0235

Toth, S. J. Agricultural value of dried poultry manure and bedding. Compost Science, 5(3):29, 30, 32, Autumn-Winter 1965.

A study was conducted to determine the agricultural value of artificially dried poultry manure plus bedding using various plants as test crops. Tests were run using an automatic dryer to determine the best temperature to employ without materially reducing the N content of the final product. The mean values for N, phosphorus pentoxide, and potassium oxide contents of the six batches of processed poultry manure and bedding were 3.84, 6.30, and 1.97 percent respectively. The test field was a sandy loam soil with a pH of 6.3. The test crops in 1960 were snapbeans and sweet corn, and in 1961 Irish potatoes. The manure and/or fertilizer was broadcast and disced in prior to seedling. The results which are tabulated, compare poultry manure and 5-10-10 fertilizer, and poultry manure and manure reinforced with muriate of potash, the latter treatment included because of the low K content of the manure. Yields of snapbeans increased as the rate of application of the manure increased from 1 to 3 tons an acre. However, the results obtained with 1,200 lb of 5-10-10 were greater than those obtained with all the manure applications. The addition of potash failed to increase the yield significantly. The yields of potato tubers and their mineral contents are tabulated. It was found that considerable variation can be expected in the N, phosphorous pentoxide and potassium oxide contents of the final product, but generally it can be considered to be a 3-6-2 fertilizer. A ton of processed poultry manure and bedding has about the same effect as 1,200 lb of 5-10-10 fertilizer. The small residual value of the processed manure and bedding was apparent in the yield of potato tubers.

65-0236
Utilization of non-processed manure for fertilizing fruits and vegetables. Staedtehygiene, 16(9):196-197, Sept. 1965.

Three representatives in the lower house of the federal government of West Germany complained that no bill has yet been enacted to control the use of non-processed manure as fertilizers. It contaminates fruits and vegetables with salmonella which can survive up to 40 days after application of this manure, and which cause numerous intestinal diseases. A bill prohibiting the use of non-processed manure was worked out in 1954 but could not be enacted into law so far because of the doubtful legality of such a bill, as State Secretary Bargatzky informed the complainants. But he assured them that the government will continue its investigations in this matter.

65-0237
Waste treatment and disposal. Farm Chemicals, 128(9):38-46, Sept. 1965.

Although there are waste treatment disposal methods available that are versatile enough to remove almost any harmful impurity, the main problem is reconciling the cost of removal with the necessity for achieving the minimum contamination of the environment. The basic methods of handling plant wastes are given in an excerpt from the NAC manual on 'Waste Disposal'. The various discussions indicate the advantages, disadvantages, and the preliminary investigation required for each method of waste treatment and disposal. The methods outlined include biological, ponding, burial, incineration, contract services, disposal at sea, chemical disposal, and municipal treatment. A sketch is given of waste treatment by trickling filters in which waste after neutralization passes over trickling filter where the film or mass of organisms on the packing surface absorbs and oxidizes the organic matter in the waste water. The effluent goes to a settling basin from which the effluent is discharged to a waterway and the settled solids go to a sludge digestor, lagoon or incinerator. Similar sketches are given of waste treatment by activated sludge and by oxidation pond. The use of contract services whereby some organization removes the waste is a convenience for industrial plants too small to warrant in-plant disposal services, but it does not solve the problem. Responsibility is removed from company to the contractor, but from a legal standpoint, there is a possibility of both the contractor and the company being held liable for improper handling and disposal. A review is presented of waste treatment and disposal methods.

AUTOMOBILE DISPOSAL

65-0238
Abandoned cars. Public Cleansing, 55(7):431, July 1965.

Edinburgh's policy on abandoned cars is described. If the owner can be located, a 2 week disposal period is set; otherwise, a 6 week impounding period during which the vehicle can be reclaimed is established.

65-0239
Car disposal made easy. Public Cleansing, 55(10):559-563, Oct. 1965.

The baling of cars in a 40-ton trailer-borne baling press is described. This press, capable of baling two car bodies at a time, has been hailed as the answer to the growing social problem of abandoned cars. The portable baler is used at the dump sites of various municipalities in Great Britain.

65-0240
Cars drowned by Swedish skipper. Refuse Removal Journal, 8(4):38, Apr. 1965.

Captain Otto Magnusson, skipper of the Swedish ship, Ostkust, has a thriving business of disposing of unwanted cars at sea. Wealthy Sweden is producing and importing automobiles at so fast a rate that any car over five years old is being junked since it has no resale value. The captain charges $22 to $32 a car, depending on size, and the price includes a pick up service. He loads the unwanted jalopies on board his vessel and hauls them to the deepest part of the Baltic Sea, where they are shoved overboard.

65-0241
Disposal of abandoned automobiles. Public Works, 96(5):82, May 1965.

The disposal of abandoned automobiles is a problem in England. Abandoned cars are not only an eye-sore but a potential danger to children. If abandoned in the open they should be removed as soon as possible to prevent accidents to children and to avoid stripping of wheels and other useful parts; it is costly to remove a vehicle once it has been stripped and the scrap value may be negligible. There may be delay in removing cars abandoned on a street as there is no clear understanding between police and local authorities about their powers under the Removal of Vehicles Regulations. It is suggested that unless it is necessary for the police to remove the vehicle as constituting a traffic hazard, it should be the responsibility of local authorities. In some cases the local authorities themselves break up derelict cars and sell the scrap. One authority has leased sites to car breakers close to their depot; the breakers strip the vehicles and sell sections to the authority, who sell the scrap. The demand for scrap is variable.

65-0242
English data on disposal of abandoned vehicles. Public Works, 96(6):92, June 1965.

Removal and disposal of abandoned vehicles is an increasing problem in England, due in part to the requirement for testing of vehicles which are more than 5 years old. In Fulham, from August to December 1963, 62 abandoned vehicles were removed at an average cost of about $19.00 per vehicle. Allowing an average scrap value of $5.60, which is probably high, the net cost is considerable. Since special equipment is necessary for disposal, it is recommended that depots be established which would be financed by a group of municipalities. These depots could be equipped with the usual or necessary presses for baling, prior to disposal as scrap metal.

65-0243
Hurst, S. S. Scrap motor cars--another viewpoint. Public Cleansing, 55(11):634-636, Nov. 1965.

Scrap metal in general is a marketable British product, but the scrap car poses difficulties. An outline for car breaking procedure is given. It is pointed out that financially it is not profitable to dispose of scrap cars unless subsidized by the local government as a necessary public service. Much of a scrap yard's revenue comes from automobile fix-it-yourselfers. Necessary equipment for scrapping vehicles is listed. Some countries dump old cars unsalvaged into the ocean. Each area must decide the method and extent of its scrap car salvage program.

65-0244
Junked cars just don't fade away. APWA [American Public Works Association] Reporter, 32(3):6-8, 12, Mar. 1965.

Of the 5 million automobiles taken out of service in 1964, many were returned to steel mills for smelting. However steel mills are rapidly changing over to basic oxygen furnaces which require 10 to 17 percent less scrap. Therefore car scrap, tagged as 'least desirable' because of its impurities of wood, plastic, glass and metallic impurities, will have a 16 percent loss in the market. Statistics show that the amount and price of scrap between 1956 to 1963 fell over 53 percent or down to $19.84 for each Number 2 bundle. Or a $3,000 car is worth only $20 as scrap. Over half the cars junked each year are placed in auto yards to be stripped of usable parts. Prior to burning, the car is placed on a 'stripping line.' The car is then burned, cooled and pressed into a bale 2 by 2 by 4½ ft. Statistics show that in

1960 there were 2,500 cars abandoned on the New York streets, and by 1964 the number rose to 25,000. Since screening or fencing to conceal the scrap is not sufficient, possibly shredding or pelletizers offer some hope. The Proler plant can process 1,000 cars per day but the installations cost $2 million and up, and many sections of the country can't support the capital investment. The Linz-Donawitz method of basic oxygen process uses 30 percent scrap while the Stora-Kaldo uses 55 percent. This rate of consumption offers some hope for the future. However we cannot sell more scrap than the steel mills can use.

65-0245
Lloyd, G., and R. McCann. Waging war on abandoned autos. American City, 80(11):98-100, Nov. 1965.

The number of abandoned autos has increased, and the Chicago Police Department has found it increasingly difficult to perform its duties including towing. Some of the restricting circumstances are the almost complete absence of tow trucks, inadequate organizational structure and procedures, legal restrictions on the method of disposal as stated in the State law, and inadequate facilities for storing abandoned autos. To meet the crisis, private towing concerns were contracted and towing immediately surged. The organization and procedures dealing with abandoned autos were changed. Formerly, the responsibility rested with the Stolen Auto Section of the Detective Bureau, but the Auto Pounds Section was created to have complete control over towing, custody, and disposal of impounded autos. In September 1960, the department operated eight pounds for the storage and safekeeping of cars, but since that time the number of pounds were reduced and the specialization of functions eliminated. An amendment to the State law granted permission to sell the autos by competitive bidding to junk dealers. This resulted in a more rapid turnover in available storage space. The removal and custody of abandoned autos only occurs with those which are in a complete state of disrepair (no engine or wheels), or those which have not been moved for 7 consecutive days. Vehicles of 1960 vintage or newer, automatically receive an appraisal of $100 or more, therefore going to the auction block. Contract terms call for sales to licensed automobile wreckers or used-parts dealers only.

65-0246
New York to accept unwanted jalopies. Refuse Removal Journal, 8(4):28, Apr. 1965.

In order to do away with the abandonment of old cars on city streets, the Department of Sanitation of the City of New York is offering the facilities of its encumbrance yards, garages, landfill, and incinerators to motorists who wish to dispose of unwanted vehicles legally. The action was taken in anticipation of a large number of motor vehicles which owners probably will relinquish rather than incur the expense of new registrations, insurance renewals, and other costs. The Department sites will be available throughout 1965. Owners may drive their vehicles, or have them towed to any Department base in their home vicinity. The city prefers private means of legal disposal, including selling old cars to junk dealers, but would rather accept them at all Department locations, than have the autos abandoned to become street hazards.

65-0247
Operation clean sweep. Western City, 41(3):27, Mar. 1965.

Merced (population 23,000) initiated a new program whereby the city removed substandard housing. This program later inspired 'Operation Clean Sweep'. The Department of Motor Vehicles together with police and Fire Prevention Bureau located abandoned cars on private property and removed them at no charge. In the first few months 165 vehicles were removed and approximately 50 more were waiting. This program has given the city a new look and has spurred additional capital investments to further protect assessed valuations.

65-0248
Pelletizing scrap. Waste Trade World, 106(25):3, June 19, 1965.

The car disposal problem was the center of attention at the BIR congress. A color film was shown on the Luria 'auto-eater' fragmentizer (or pelletizer) technique. Mr. Luria was present to answer questions after the showing. The film showed the giant plant, which is installed in Los Angeles, together with close-ups of car bodies entering the 'mouth' of the machine and coming out at the other end in the form of pellets which can be varied in size for specific purposes. The main technical advantages are a cleaner end-product, scrap in a form more suitable for new steelmaking techniques, and the elimination of incineration. Economically, the fragmentizer technique is not easy to fit into European conditions, although a smaller model for less concentrated scrap areas is now being developed.

65-0249
Portable crusher speeds auto salvage. Refuse Removal Journal, 8(9):32-33, Sept. 1965.

An auto body crusher, made by Aljon, Inc., compresses an average body into a 6-in. thick slab in about 5 minutes. The unit used by the Alter Co. of Davenport, Iowa, can be transported in a flat truck from one salvage yard to another. Scrapped cars are pulled through the machine by an endless cable arrangement.

65-0250
Shults, F. Getting to grips with the problem of littering cars. Public Cleansing, 55(2):110-114, Feb. 1965.

The formation and operating procedures of an abandoned vehicle department in the London fringe area of Tottenham are reported. Safety inspections have increased the number of abandoned vehicles into a traffic and safety problem. A reportedly abandoned vehicle is first inquired about and inspected. This effected the removal of about one-half of the 239 vehicles reported in the 8 months the department has operated. The city contracts for $5 per car for towing of abandoned cars to an impounding area, where they are kept for 2 months, and then sold to the high bidders to recover costs. Copies of the abandoned vehicle report, and report for disposal of vehicles brought in by owners, and analysis of the department's results are included.

65-0251
Shults, F. London centre discusses abandoned vehicles. Public Cleansing, 55(12):698-709, Dec. 1965.

A paper and discussion on Britain's abandoned vehicle problem is presented. Elimination of the long administrative procedures necessary to deal with abandoned vehicles and a specialist to head an area's vehicle disposal and develop a liaison with police are considered. A brief outline of the city of Tottenham's abandoned vehicle program is included where cars are impounded for six weeks and then auctioned to scrap dealers. There is a trend towards plastic car bodies which may complicate disposal in the future. It is suggested that emphasis be shifted from local authorities finding owners to having owners seek out their car after it is impounded. A list of British legislation on abandoned vehicles is included. The discussion brings out that 85 percent of old cars are dealt with by scrap merchants and industry, who were also willing to pay to dispose of the municipal's 15 percent. Police coordination is emphasized, and contract methods of disposal operating in several British communities are explained.

65-0252
Solid wastes. Automobile hulks. In Restoring the quality of our environment. Report of the Environmental Pollution Panel, President's Science Advisory Committee. Washington, U.S. Government Printing Office. Nov. 1965. p.154-156.

The current junk car problem is generally conceded to be 'visual pollution'; its genesis is primarily economic rather than technological. Old automobile hulks represent a source of important scrap metal, however; the objective is and should continue to be their reconversion to industrial use. A number of influences are acting to interrupt a normal recycling of scrap from old cars back into steel furnaces. The cost of collecting, processing, and transporting auto hulks is high and the price of the product is low compared to other desired forms of ferrous metal scrap; changes in the steel-making process require less scrap than formerly; and the number of autos junked each year is steadily increasing. Some research is in progress to find uses for auto hulks other than as scrap steel. The most promising seems to be combining the scrap with low grade taconic ore in order to make it magnetic and improve its characteristics. Other possibilities include: (a) to design automobiles so they can be more easily cannibalized; (b) to increase the interchangeability of auto parts, so that the junk car might be cannibalized more rapidly for its parts; and (c) the consider the reconcentration of auto hulks, in effect building an artifical iron mountain as a future resource.

65-0253
Somerville, A. T. The problem of abandoned cars and vehicles. Public Cleansing, 55(10):596-599, Oct. 1965.

The general abandoned car problem is considered. The introduction of the compulsory

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vehicle test has magnified the abandoned car problem in London to 6,000 in 1963. Manchester offers 4 centers for free disposal of old cars; Tottenham removes cars to a pound after an attempt to notify the owners, South Shields posts a notice on the car, photographs it, and then 6 weeks later removes the car. A city undertaking car disposal needs a break-down vehicle with a crane, or lifting arms to remove old cars, oxyacetylene cutter, and a baling press. Hiring of a mobile baler requires at least 200 car bodies to be economical. Difficulties in storing and cleaning scrap car bodies, metal and fiber-glass, are mentioned.

65-0254

Story, W. S. Need measures to aid abandoned car salvage. Refuse Removal Journal, 8(11):20, Nov. 1965.

The scrap industry is an important part of national conservation of resources, for it can be used in place of iron ore, coke, and limestone in making new steel. Five million tons of scrap were provided in 1964 by junked cars alone. The scrap industry has special equipment for handling auto scrap, to shred, refine and mill the scrap. What is needed, more than anything else is a ready market for scrap. Car abandonment problems are discussed. It is suggested that the time limit to claim cars be shortened, and that licenses be required for private citizens having more than two or three abandoned cars on their property.

65-0255

Turner, A. H., A. S. Moody, and H. Wilkinson. Collection and disposal of abandoned and derelict cars. Public Cleansing, 55(9):536-544, Sept. 1965.

Findings of a committee of city engineers in the 500,000 Hemel Hempstead, England, area on a scheme to dispose of abandoned and derelict cars are reported. The scheme as proposed involved a consortium of local councils, and finance was to be apportioned on rateable value. The study involves data on estimating number of vehicles which would require disposal, the facilities and location of the central depot, vehicle delivery and storage, salvage technique, labor requirements, and cost estimates. The committee estimated that equipment and land suitable for 8 to 25 cars per day could be purchased at $250,000, and that the total excess of expenditure over income from salvage would be about $43,000 per year. An appendix listing British laws enabling cities to dispose of vehicles is included. The committee agreed that it was the local authority's responsibility to offer a free collection and disposal service for unwanted vehicles, that vehicles should be incinerated to obviate smoke and smell, and that a mechanical baler for sheet metal parts be provided. Findings of a committee of city engineers in the 500,000 Hemel Hempstead, England, area on a scheme to dispose of abandoned and derelict cars are reported. The scheme as proposed involved a consortium of local councils, and finance was to be apportioned on rateable value. The study involves data on estimating number of vehicles.

65-0256

U.S. scrap car study. Waste Trade World, 107(26):9, Dec. 25, 1965.

The U.S. Bureau of Mines is conducting a nationwide study to obtain a definitive picture of the scrap car problem and the complex factors underlying it in different parts of the country. Detailed interviews with selected auto wreckers and scrap processors will focus on where and why scrap cars are piling up. The study is designed to provide data for two major Government objectives: the conservation of valuable metals contained in scrap cars and the removal of the 'auto-graveyard' which spoils the natural beauty of the landscape. The Bureau feels that the causes for instability in the scrap metal market, which need to be defined and removed, vary from one part of the country to another. Data obtained from the study will be used to plan regional conservation and beautification programs.

65-0257

Vehicle disposal in a standard press. Public Cleansing, 55(4):202-203, Apr. 1965.

A 100 ton metal baling press in Salford, England, used for disposing of tin cans, bikes, and other scrap metal, has been used for vehicle baling. The vehicle is systematically cut up by oxy-acetylene burners, then further cut by the press, and finally contained within the press and baled. A large, burned out car was reduced to 8 bales totaling 1,300 lb and about 1,400 lb of other metal from axles, engines, etc. Two men could bale 6 cars in 8 hr using the press.

COMPOSTING

65-0258

Another plea for research. Public Cleansing, 55(6):352-353, June 1965.

Composting of refuse to replace valuable constituents in soil which are removed by cultivation is reported. The Dutch use this system, but decreasingly because of increasing contraries in compost. Research to establish the real value of compost, the effect of contraries, and the biochemistry involved is recommended.

65-0259

Beckett, J. L., and H. R. Oakley. Sewage disposal and refuse composting in Leicester, England. Compost Science, 6(1):5-8, Spring 1965.

An integrated system for the treatment and disposal of sewage sludge and refuse in the City of Leicester, England, is described. A sewage treatment plant and a refuse composting plant were built adjacent to each other and their activities coordinated. The Dano Bio Stabilizer process was used in the composting plant, and six stabilizers, providing a total capacity of 325 ton per day, were installed. Equipment for salvage was also provided. For the sludge drying in the sewage plant, four Komline coil filters were selected. These were arranged so that the outer two filters each feed a single Bio-Stabilizer and the two inner filters each discharged to two stabilizers. The whole plant was designed on the basis that the minimum quantity of sludge will be dried and the maximum quantity of sludge fed wet to the stabilizers. Operation of the plant will be controlled so that wet sludge is added to each unit to ensure that the combined moisture content of the mixed refuse, dried sludge and wet sludge, is between 50 and 60 percent. The design and operation of the composting plant, which in addition to the Bio-Stabilizers includes an incinerator, and provision for salvage, is described in detail. Total cost of the plant is estimated at £3,720,000. Detailed specifications are given for the reception hall, salvage hall, Dano Bio-Stabilizers, and screening houses.

65-0260

Behe, R. A. Disposal of municipal garbage by composting. Journal of Environmental Health, 27(5):824-829, Mar.-Apr. 1965.

Composting of garbage has attracted considerable interest in the United States during the past several years. It has been practiced in Europe and Israel for many years. Sanitary landfill disposal is a necessary part of the composting system for disposal of non-compostables and non-salvageable items. This material represents only a small percentage of the total refuse. In Altoona, Pennsylvania, one of the successful composting plants in the United States is located. It has been in operation for 3½ years. The present daily input of refuse is 35 to 45 tons. Garbage is deposited on a platform outside and is pushed into two grinders by a front end loader. A 40 hp, 650 rpm motor operates the grinders. Tungsten carbide tips shred the material into a finely ground slurry, and the ground garbage is discharged into a collection tank. A screen in the tank separates the scrap trash. The garbage is forced into the dewatering screws and then transported to the windrows by truck. A digestor, recently installed, has replaced the windrowing. This digestor has many outstanding features, among which is lack of objectionable odors. The compost is still put in windrows for a short curing time. It takes only 4 or 5 days to reach this point. Then, the compost is fed into a dryer for about 20 minutes and finally is ready for shipment. This operation is fully automatic and involves little manpower. There are no public health problems connected with the operation. It is flexible in that it can be applied to any composting operation and can be used for digestion of garbage as well as sewage sludge.

65-0261

Bell, C. W. Put your leaves to work. American City, 80(8):112-113, Aug. 1965.

The efforts of Neosho, Missouri, a city of 7,750 people, in preparing compost from the fall leaf collection for use in 3,340 flower plots and boxes in the city are described. Cost of the project is $2,618. Manures, sawdust, wood chips, phosphate, and limestone are added to enrich the compost and speed the composting process to completion in about 2 weeks.

65-0262
Blonk, D. M. de. Engineering behavior of a waste conversion end product. Defense Documentation Center. [Pittsburgh, Pa.], University of Pittsburgh, 1965. 111 p. (NTIS:AD 617290.)

A look at the engineering behavior of the end product of a waste conversion process used as a landfill is presented. The laboratory program investigated the densities of the compost material and subjected it to the compression, compaction, consolidation and the California bearing ratio tests used in engineering practices. The behavior of the compost as a result of the above tests is tabulated. A general discussion of the laboratory results is given. The engineering behavior of compost used as landfill based on supporting data is examined. Advantages, disadvantages, applicability and related problems are defined. Recommendations for future study, appendices, a bibliography, and list of uncited references are included.

65-0263
Blonk, D. M. de. Laboratory program. In Engineering behavior of a waste conversion end product. (NTIS:AD617290) Defense Documentation Center. [Pittsburgh, Pa.], University of Pittsburgh, 1965. p.4-9.

The waste conversion end product material (compost) used in this investigation, as received, had a moisture content of from 49 percent to 58 percent of dry weight (at 105 C). The specific gravity of a soil is often used in relating the weight and volume of a soil. Unit weights are needed in nearly all measures of pressure settlement and slope stability in soil engineering. Thirty-two compaction tests were used to determine compaction behavior and were conducted with moisture contents varying from 12 percent to 98 percent. Tests used were: the Harvard miniature compaction test; the standard Proctor compaction test; the static compaction test; unconfined compression test; triaxial compression test; consolidation test; and California bearing ratio test. The total weight, moisture content, and dry density were determined in each test sample.

65-0264
Blonk, D. H. de. Results of the test program. In Engineering behavior of a waste conversion end product. Defense Documentation Center. [Pittsburgh, Pa.], University of Pittsburgh, 1965. p.10-14. (NTIS:AD 617290.)

The specific gravity of the solid portion of the sample material used, as determined by standard soil methods, was 2.1. Results of the compaction and compression tests are shown in appendices. For the Harvard Miniature compaction tests, the optimum moisture content ranged from 58 percent to 62 percent of dry weight at 105 C. The maximum dry density obtained was 50.8 lb per cu ft at a moisture content of 60.9 percent. The optimum moisture content for the Standard Proctor compaction tests ranged from 65 percent to 72 percent of dry weight at 105 C, and the maximum dry density obtained was 45.4 lb per cu ft at a moisture content of 67.8 percent. The static compaction tests gave an optimum moisture range of 20 percent to 24 percent of dry weight at 105 C with the maximum dry density obtained of 59.7 lb per cu ft at a moisture content of 22 percent. The stress controlled samples showed a greater unconfined compressive strength than the strain controlled tests; however, the results from both series of tests were similar. Unconfined strength seems to be independent of water content or dry density in the range of optimum moisture. The appearance of the stress vs. strain curves for confined compression behavior tests were similar to those of the unconfined test except that the former had larger values of stress resulting from the confining pressure. The test results of the California Bearing Ratio indicated that the CBR value is dependent on the dry density at a constant moisture content.

65-0265
Blonk, D. M. de. Discussion of laboratory results. In Engineering behavior of a waste conversion end product. Defense Documentation Center. [Pittsburgh, Pa.], University of Pittsburgh, 1965. p.15-19. (NTIS:AD 617290.)

The behavior patterns of ordinary engineering soils are not clearly understood. Soil systems consist of three phases: inorganic, solid mineral grains; water, either absorbed on the surfaces of the grains or free in the void spaces; and air (or other gases) existing as discontinous air space through the soil system. The behavior of the compost material is additionally complex, due to its composition and the related biological and chemical action. The total densities of the laboratory samples were from 55 to 82 lb per cu ft as compared to a previous field test sample yielding 12.8 lb per cu ft. It is thus apparent that a waste conversion end product, compacted to a dry density of 50 lb per cu ft, would give a greater reduction in volume of refuse material. Compression behavior data shows that the waste conversion end product is much more compressive than ordinary fill material or the soil upon which structures are usually found.

65-0266
Blonk, D. M. de. Engineering behavior of compost landfill. In Engineering behavior of a waste conversion end product. Defense Documentation Center. [Pittsburgh, Pa.], University of Pittsburgh, 1965. p.20-41. (NTIS:AD 617290.)

Availability and light weight are the advantages of using compost material in land reclamation. Evaluation parameters used in this hypothetical case are: total height of the finished landfill is 20 ft; the material is placed in layers at the rate of 3 ft per month; the material has the same properties as determined by previous laboratory tests; and the underlying soil presents a good foundation. Using the above parameters the following aspects were considered: method of placement; trafficability of the fill at all stages; settlement of the surface of the fill versus time; bearing capacity, settlement, and foundation treatment for structures on the completed fill; pavements used for highways or airfield runways; general considerations for supporting utilities and slopes terminating at the fill area. Supporting data are given in equations, tables, and charts.

65-0267
Blonk, D. M. de. Summary and conclusions. In Engineering behavior of a waste conversion end product. Defense Documentation Center. [Pittsburgh, Pa.], University of Pittsburgh, 1965. p.42-44. (NTIS:617 290.)

In using standard soil mechanics techniques to evaluate the behavior of the compost material in engineering situations the following conclusions are drawn: the compost product can be successfully utilized as a fill material; while not the best landfill material, its advantages are availability and light weight; filling should be carefully controlled and continual checks should be made of the dry densities of the 8-in. compacted layers; landfills should be capped with a suitable covering; slopes terminating at the landfills will be stable at 1½ horizontal on 1 vertical if properly protected; the surface of a completed landfill will ultimately settle from 3 percent to 8 percent of the total thickness due to its compressibility; foundation types are limited to secondary structures using spread footing, one story and light 2 story buildings on raft foundations, larger buildings on caissons through the fill; use of roadways and runways should be limited; and as the fill is being constructed it will probably be trafficable to all but the heaviest trucks and construction equipment.

65-0268
Blonk, D. M. de. Recommendations for future study. In Engineering behavior of a waste conversion end product. Defense Documentation Center. [Pittsburgh, Pa.], University of Pittsburgh, 1965. p.45-47. (NTIS:AD 617 290.)

Laboratory studies and field tests are recommended for future study of composts used as landfills. The laboratory studies might include: chemical analysis to investigate the nature, magnitude, and rate of the biological and chemical processes; investigation of engineering behavior with avriations in composition of the compost material; the effect of chemical or biological degradation of the material upon its engineering behavior; and investigation of the hydraulic behavior (permeability) of the material. The field tests might be done on a large scale field situation with the construction of a landfill of compost material 20 ft high and the limited width. Field measurements of the material might involve: moisture content; density measurements; settlement studies versus time; load carrying capacity; negative skin friction; and uniformity of temperature throughout the fill. For a more thorough analysis smaller fills should also be constructed.

Composting

65-0269

Bridger, R. The ABC of waste conversion - Part I. Compost Science, 6(1):27-29, Spring 1965.

With the world population increasing about 50 million annually, substantial amounts of farm crops and domestic livestock will be needed in the future. On a world average, it takes about 1½ acres of cultivated land to support each person, and the soil bacteria which may be derived from waste products are of great significance in maintaining our ecosystem. Animal manure may not always be incorporated directly with the soil, but may first interact with vegetable residues on the surface, in which case sheet composting will occur. Plant debris, which has accumulated from the previous season's growth, is slow to disintegrate of its own accord. It has been shown that the organisms decomposing the celluloses and pentosans require a definite amount of nitrogen. Nitrogen is a very unstable substance and added in isolation can make little headway. For an increase of one part of nitrogen in the soil, ten parts of carbon must be added. If farmyard manure is used properly, fermentation will take place and the result will be a compost. The least losses in storing farmyard manure occur when the manure is carted direct to the fields from the animal sheds or stored under anaerobic conditions at a temperature of 26 C. Farmers are decreasing in number and livestock wastes are not being regarded as something to be made the most of, but looked on as just a nuisance.

65-0270

Brunt, L. P. Composting treatment of town refuse and sewage sludge. Institution of Public Health Engineers Journal, 64(2):73-99, Apr. 1965.

This review of the technological aspects of the composting process and its application to the treatment of refuse and sludge also reviews the other established methods of treatment for purposes of comparison. Limitations with special attention to controlled dumping, pulverizing, and incineration are discussed. Four tables are given of the data covered in the discussion. Table 1 covers the characteristics of refuse in Great Britain showing the percentages of the various components which in the estimated overall analysis for 1964 show 25 percent paper and cardboard, 10.5 percent vegetable and putrescible matter with an average of 325 lb per cu yd. Table 2 shows the results of pulverizing of the refuse while Table 3 gives the data on composting treatment of the refuse, and finally the data on incineration of refuse is given in Table 4. It was concluded that there was a possibility that many towns in Great Britain may be able to dispose of a significant quantity of the sludge from their sewage treatment works by composting with the available garbage from their refuse. The content of animal residue in the garbage itself, such as meat and fish scraps, food wastes, dung from sweepings, dead birds, dogs, and cats fell short of the level required for true composting and thus sludge treatment is required.

65-0271

Bylin, J. E. More cities discover savings in converting garbage to fertilizer. The Wall Street Journal, 166(38):1, Aug. 24, 1965.

In order to trim garbage disposal costs, Elmira, New York, has its rubbish converted to compost, a soil conditioning material, which itself enriches the soil, or when chemically treated, produces fertilizer. Elmira will save $30,000 (costs now are $117,000 per year) in disposing of its 20,000 tons of trash. Houston, St. Petersburg, Rochester, and many European cities have adopted similar programs. National Organic Corporation, Westinghouse, Allstate Insurance, and Foster Wheeler Corporation represent companies making commercial use of refuse, an increasingly popular plan due to lack of available burial sites. Presently, 150 million tons per year of trash is thrown away; by 1980, 260 million tons will be generated. The Federal Government is presently attacking the problem with studies and grants. At Elmira, NORCO breaks down all rubbish for soil conditioner, unlike other companies which salvage tin and glass (25% of trash) for sale. Formerly slow compost sales hampered private ventures, but now cities subsidize part of expenses. Other proposed ways to use rubbish for profit include transferring it into gas and charcoal (Pan American Resources, Inc.), power for desalinization plants (Foster-Wheeler), and electrical generator power (TRW).

65-0272
Composting. American City, 80(6):13, July 1965.

Nine members of the House have introduced bills on new refuse disposal methods, authorizing $7,500,000 for demonstration plants and $7,000,000 per year for provisions of the act.

65-0273
Composting gets a tryout. American City, 80(4):99-102, Apr. 1965.

SACS, Inc. operates a composting plant in San Fernando, California, which costs $9,000 to $14,000 per ton to build and $3.50 to $4.50 per ton to operate. The final product is less than 20 percent of volume and about 80 percent of weight of incoming refuse. Metal, lumber, paper to be shredded, rags, rubber, plastic and glass are salvaged--representing about 20 percent of refuse handled. Remaining material enters a pulverator. The tumbling action mixes water with refuse to a moisture content of 45 to 65 percent where decomposition takes place best. An impact-type grinder, with flails fastened to a rotating shaft by chains, further reduces size. The material is aerated in the digestor. Temperatures averaging 160 F kill harmful organisms and weed seeds. After composting, the material passes into a rotating screen to separate fine material from the coarse. The final product has one percentage nitrogen, one percentage phosphorous, and one percent potash. It is similar to peat moss. It complements fertilizer, but is not a substitute. For plants processing 150 to 300 tons per day, the developers recommended 3½ acres. San Fernando disposes of refuse at SACS at a cheaper rate than by haul to a landfill in the foothills. The process does not contribute to air pollution.

65-0274
Davies, A. G. Points to consider in refuse disposal. Compost Science, 5(3):23, Autumn-Winter 1965.

The amount of refuse to be disposed of annually will increase in volume disproportionately to weight, whatever system of disposal is adopted--controlled tipping, incineration or composting--a large proportion of the refuse must go back into or onto the land, and the land available for untreated refuse is limited. The English towns of Cheadle and Gatley have chosen the Simon-Lawden compost process. The plant is designed to deal with 57 tons of household refuse per day, but may be extended. Crude refuse is received at a low level hopper. The refuse is then conveyed beneath a magnetic separator, and salvageable material is hand-picked from the same belt. The tailings are roughly pulverized and conveyed by bucket elevator to a digester where the decomposition of refuse takes place. The plant will require one foremen, one tractor driver and six laborers for its operation. A range of twelve standard-unit plants is designed to cover all normal requirements for communities varying in population from below 50,000 to over 300,000. The range consists of three basic types of plant, for transfer, incineration and composting respectively, each available in four sizes. The composting plants are designed to process household refuse from which all the tin, and a certain amount of paper, has been removed. The process consists of retaining the refuse for 5 days within the digesters through which the refuse moves slowly at a controlled rate.

65-0275
Donhue, J. R. The development of compost plant design. Public Cleansing, 55(4):209-217, Apr. 1965.

A history of compost plant development with descriptions of the operation of plants following the windrow, vertical, and Fermascreen systems, with arguments favoring the Fermascreen system for cities of less than 50,000 is reported. General discussion of pulverization, sorting, mixing, fermenting, glass separation, and economy are included. Large compost plants, illustrated by the Bangkok 325 ton per day plant, require several different machines and operations to prepare the refuse. The Fermascreen method, involving a single wire barrel which can be rotated, allows pulverizing, mixing, and alternate decomposition and agitation, and finally sorting of the conglomerate into usable compost, and glass, rags and other wastes, all in one machine. The Fermascreen type of machine is especially efficient for small scale composting operations. (Text-German)

Composting

65-0276

Dyal, R. S., and R. R. Robinson. Organic matter. In Consumers all--the yearbook of agriculture 1965. Washington, U.S. Government Printing Office, 1965. p.221-224.

Improving soil condition with organic matter increases plant growth and root development. Leaves, manure, and plant wastes containing nitrogen are often used. Never put meat scraps in a compost pile. Soft organic materials, such as grass, compost better when mixed with coarse material. Smaller particles decompose faster than larger ones. The pile should be moist and large enough to maintain favorable temperatures. Optimum size is 6 ft high and 5 to 6 ft wide with alternate 6-in. thick layers of organic material and soil. One cup ammonium sulfate, one-half cup superphosphate, a tablespoon of epsom salt, and two-thirds cup ground limestone per packed bushel should be added as nutrients. A flat top that slants toward the center catches rainfall. Composting will not kill all disease-carrying organisms and weed seeds. Procedure for spreading fertilizer and organic matter on various types of plants is given.

65-0277

English, M. C. The economics of composting in Holland. Public Cleansing, 55(3):146-148, Mar. 1965.

The costs, agencies, and markets of compost in Holland are reported. V.A.M. (Dutch for Refuse Disposal Company, Ltd.) manufactures 50 percent and distributes 75 percent of all the nations 210,000 ton per year compost output. An increase in quality of the compost, eliminating glass and clinker, has opened markets to vegetable, fruit and bulb growers and also on lawns and parks. Buyers pay $1.70 to $4.50 per ton, depending on quality, plus shipping costs (about 50% of compost price.) The company's loss on production and sale, presently $1.55 per ton is made up by the cities disposing of their refuse through V.A.M. About 25 percent of Holland's municipal refuse is disposed of by composting, primarily through the government-instituted agency of V.A.M. Municipal costs of $4 to $5 per ton for total collection and disposal are common. Without V.A.M.'s national initiative, composting would probably not be feasible.

65-0278

Farkasdi, G. Do additives affect windrow composting of refuse and sludge? Compost Science, 6(1):11-13, Spring 1965.

The effect of various additives on windrow composting of refuse and sludge is presented. In experiments conducted in 1961 and 1962 at Giesen University Institute, three accelerating agents 'Edafil', 'Proteg Oleo', and 'Zusaetze-Frankfurt', and two compost starters 'Multibacto' and 'B.D. Starter' were tested. The effect of these additives was checked by composting without grinding (Baden-Baden system), by composting with grinding (Rasping method), and by windrow composting following pre-composting in a digestor (Dano process). The experimental windrows were 1.5 m high, 2.0 m wide, and 5.0 m long. Two parallel windrows were treated with the same additive, the piles were stacked in layers and the additives were suspended in water and appropriate amounts were evenly mixed into the piles. The control piles received an equivalent amount of chlorine-free water and specially prepared samples of refuse put in porous plastic bags and placed in the middle of the piles. These samples, for subsequent examination, were separated as to pathogenic and non-pathogenic content. Piles were turned during the third, sixth, and ninth weeks, and were dismantled after about 14 weeks of composting. Samples were taken for examination after each turning and after completion. The physical tests were for temperature, reaction (pH), and particle size, and the chemical tests for carbon dioxide, oxygen, water, and ash contents, as well as volatile solids and ammonia content. The microbiological tests included the determination of total germ counts and self-heating capacity. Tabulated results are presented for speed of temperature rise on the seventh day, rise of temperature above 55 C and variations in ammonia content. It was concluded that the results of many experiments indicated that no significant effects were obtained with the stimulating or inoculation agents that were used. The use of additives did not show any hygienic advantage.

65-0279

Fuller, W. H., and S. Bosma. The nitrogen requirment of some municipal composts. Compost Science, 6(2):26-32, Summer 1965.

Any reduction in time necessary to prepare a mature compost greatly enhances the chance for a successful operation. The time necessary for decomposition processes to produce a mature compost is dependent upon such chemical factors as: the relative proportion of the major plant constituents present, such as cellulose, hemicellulose, polysaccharides, etc., and the relative proportion or ratio of nitrogen to carbon. In general, materials of C/N ratios above 40 require nitrogen in order to attain maximum rates of decomposition. The simplest and most accurate method for evaluating the need for nitrogen is to add small increasing increments of nitrogen to the compost and measure the effect on the general biological activity as indicated by intensity of respiration. Composting procedures do not suggest the addition of nitrogen, for the most part. The initial C/N ratio of municipal refuse in the United States varies from about 30 to 80 with most above 50, the addition of some nitrogen-containing material is advantageous. As decomposition progresses, C/N ratios narrow. Raw commercial garbage generally has 1.2 to 2.7 percent nitrogen, although this figure is less for U.S. municipal garbage. When ammonium sulfate was increased to a rate of 2.0 percent of partially digested municipal refuse, a significant decrease in microbial activity and composting was found. The effect of ammonium sulfate and ammonium hydroxide on the rate of biological attack on mature compost both alone and mixed in a soil were studied. When applied to the soil they had a slightly more inhibitory effect on microbial activity than when applied to the compost alone. Inhibition of microbial activity by ammonium sulfate and calcium nitrate is due to the high salt effect on osmotic tension of the solution, however inhibition by ammonium hydroxideappears to be due more to a direct toxic effect of the ammonia molecule than to a salt effect.

65-0280
Garbage composting. Journal of the Water Pollution Control Federation, 37(5):644-646, May 1965.

An international review of composting is presented in the form of brief statements covering 31 articles. All organic wastes may be combined in the future to produce a consolidated, stabilized end product useful as a raw material; the United States is 10 years behind in appreciating the problem of environmental health and especially that of solid waste disposal. The principal elements of composting are listed as presorting, screening, shredding, screening, pulverizing, composting, and maturation; composting is called competitive with incineration in both capital and operating costs. New equipment and processes are continuing to be developed for composting garbage; Rome is using the Gianotti system for one of its four composting plants which includes a 70 metric tons per day plant for material which cannot be composted. Before the plants were in operation, the city of Rome used 400 trucks to deliver refuse to local farmers who spread the refuse over the land or composted it first; Caspari has developed a process for combining household refuse and sewage sludge to form a stable end-product at Schweinfurt, Germany. The Kingston, Jamaica composting plant, which processes about half of the city's 120,000 tons of refuse per year, uses a grinding and windrowing method; experiments in Indonesia indicate that in small tropical cities the wastes can be composted in an economical and sanitary manner by simple windrowing. A bibliography is included.

65-0281
Keegan, P. Tenafly, New Jersey, welcomes city leaves. Compost Science, 5(3):16-17, Autumn-Winter 1965.

Each November in Tenafly, New Jersey, a huge compost pile is made out of the 17,000 cu yd of leaves collected. The program began over 10 years ago. The finished compost is used in public parks. This is a great saving for the town, for if the composted leaves were not available, topsoil would have to be purchased. Tenafly has an ordinance against burning leaves and air pollution, and the residents cooperate with the local government by placing the leaves on roadsides for the vaccum pickup machine. Since the pickup of leaves became standard throughout the community, catchbasins and drainage systems need to be cleaned only one-third as often.

65-0282
Leatherhead - sewage treatment and composting. Water and Waste Treatment, 10(7):362, May-June 1965.

A detailed report on the Leatherhead Sewage Treatment Plant and the new composting plant, presented by the plant manager at a meeting of the Institute of Sewage Purification (Apr. 8, 1965), is summarized. The new composting plant, the first mechanized one in England, was installed to replace an older one which composted refuse and sewage by an open bay method. Installation costs were £74,00 for a population of 45,000. Composting is carried out in a Dano bio-stabilizer, 74 ft long by 9 ft 1 in. in diameter, which holds up to 80 tons of refuse. The stabilizer is rotated by a 45 hp motor at about 1 rpm during the working day. Refuse tailings are fed into the non-rotating part of the stabilizer and immediately begin to revolve and move slowly towards the discharge outlet with progressive maceration. Retention varies from 2.5 to 4 days depending on the rate of feed.

65-0283
Lindstrom, R. A simple process for composting small quantities of community wastes. Compost Science, 6(1):30-32, Spring 1965.

An experimentally-tested process to achieve an aerobic biological change in organic wastes is described. Wastes are deposited into a naturally-ventilated chamber. They move by gravity to a second chamber at such a speed that the wastes are substantially decomposed when they reach it. The tank is divided by vertical partitions into two or more chambers, the upper chamber serving as a receptacle for the feces, the next one holding kitchen and garden refuse, and the lowest chamber serving as storage for the finished compost. The chambers are connected through ventilation holes in the partitions and to the outside air through air vents. An aerobic biological change in wastes of all kinds is achieved with manure as an end-product. All this is done without mechanisms and without the addition of chemicals or water. The arrangements can be connected directly to the house or building, serving as a toilet, garbage container, an apparatus for biological conversion, and collection and storage place for the converted wastes. The only costs are for the initial construction. The invention is used primarily in areas where no sewage treatment plant is available. Most of the tank is below ground level. Aeration of the wastes is of primary importance in the decomposition and determines the planning.

65-0284
McLemore, L. Houston sets up research program for wastes. Compost Science, 6(1):9-10, Spring 1965.

The Garbage Committee of the City of Houston researched the garbage problem in their city and presented a report on the disposal of residential, commercial, and industrial waste. Their old garbage dump grounds were being depleted at a rapid rate, and their incinerators were beyond repair. With incineration there is a residue of ash which must be landfilled, and landfilling is not desirable in low, flat areas where the water table is so close to the ground, as is the case in the Houston area. The committee felt that composting or mechanical methods merited a research and development program, as composting eliminates odors, rodents, flies, and provides a useful, marketable, and soil-building product. Private enterprise could invest money in this program with he City guaranteeing a specific number of tons of garbage per day. A notice was then placed in the daily newspapers inviting bids for construction, maintenance, and operation of a plant or plants with a capacity of 200 tons per day, and four companies were recommended by the Committee. Study indicated that locating the plants less than 20 minutes from the end of a collection route would save the taxpayer thousands of dollars. These plants, along with the 800-ton incinerator now under construction, will process more than 2,400 tons of garbage.

65-0285
Make compost now. The Compost Society Journal, 24(2):9-11, Apr.-May 1965.

When crops are being harvested, nature's bounty (fallen leaves) are everywhere and crop residues are there to utilize; this is an ideal time to make compost. First consider what materials are available and the greater the variety, the better balanced the compost will be. Any organic material may be used. The stack should fill the bin rather than partially fill it. The job should be completed in one operation. The bin or container is a matter of one's own choice. The sequence to be followed is to: (1) place the bin in a position of easy access; (2) dig or fork over the area to be enclosed; (3) place a layer of coarse materials as the base; (4) thoroughly mix on the ground and dampen a layer of weeds, grass clippings, or related material; (5) cover the layer with animal manure or some activator; (6) continue building the layers and, after lightly tamping and watering, seal with soil, sawdust, or straw; (7) cover with any material that will shed water; and (8) dismantle the container. If the materials are in small lengths, the breaking down process will be accelerated. In three or four weeks time the bin should be set up again and the stack turned into it. One turning should be enough, but the more turning, the faster the compost matures.

65-0286
Maystre, Y. Are bad odors always concomitant with a composting plant? Public Cleansing, 55(9):531-532, Sept. 1965.

A composting plant in Villette, Switzerland, processes wastes from eight municipalities and sludge, dehydrated to a 55 percent water content, from the adjacent biological sewage purification plant. To prevent odor fermentation, gas collected at the production points in the plant is blown into buried pipes. The soil acts as a filter. Results are better in sandy soil than clay.

65-0287
Mobile, Alabama builds 300-ton-per-day compost plant. Compost Science, 6(2):32, Summer 1965.

In March, 1965, Mobile, Alabama, had a contract for about $1,100,000 to construct a compost plant scheduled for completion in August, 1965. The plant is designed to handle 300 tons of refuse per day, 6 days per week. Incoming trucks will be weighed, driven up a ramp where refuse will be dumped into a receiving hopper and conveyor. As refuse moves, paper and rags will be salvaged; cans and ferrous metals will be removed magnetically and processed for sale. Glass will be removed and ground. The plant will have a primary and secondary grinder. After secondary grinding, moisture will be added, and the compost will be baled for inside and outside storage. A final grinder is provided for bulk shipments. This municipal project will cost around $2.60 per ton of input to operate the plant. Arrangements have been made to market the end products so that the City will make a profit on the operation.

65-0288
New compost plant for Cheadle and Gatley. Public Cleansing, 55(12):667-670, Dec. 1965.

A discussion on a new compost plant for Cheadle and Gatley, Britain is presented. Pre-separation of paper for salvage, Insect-O-Cutors for fly control, space heating of picking areas, lack of nuisance from glass in the compost, and dry-weight analysis of the compost are discussed.

65-0289
Reeves, J. B. Studies of sewage sludge and sawdust compost. Compost Science, 6(2):12, Summer 1965.

Studies were conducted in regard to the transmission of Salmonella and Shigella by composted sewage sludge as a fertilizer and soil conditioner. Early studies had indicated that the disease producing Salmonella and Shigella were not destroyed by the temperatures reached in the sawdust-sludge type of composting mixture. Studies involving moisture content of the composting mixture, humidity, temperature of the environment, and a continuous record of temperatures inside the composting windrows, were initiated. The main factors influencing attainment of high temperatures in the windrows were the moisture content and carbon-nitrogen ratio of the composting mixture. Studies were initiated to determine the amount of supplementary materials necessary to insure the attainment of adequate temperatures in composting mixtures. Molasses in varying amounts from 5 to 50 percent was utilized, and the results indicated that a temperature of 140 F was not attained, due to the raising of the moisture content. Paunch manure was tested, and Salmonella were isolated regardless of the amount of manure used. When well rotted barnyard manure was used it was found that at least 15 percent of the manure was used necessarily for a temperature of 140 F or greater. No disease-producing bacteria could be isolated from those piles. It was concluded that sustained temperatures in excess of 140 F are necessary for the production of a compost containing sewage sludge and sawdust which is safe for use as a fertilizer and soil conditioner.

65-0290
Refuse composting plant at Stuttgart, Germany. Compost Science, 5(3):10, Autumn-Winter, 1965.

In the suburban area south of Stuttgart, Germany, a composting plant was constructed to serve as a large-scale experiment for about 100,000 persons. Not all of the product is used by agriculture, the refuse being suitable for use as fill. The plant operates under the Dorr-Oliver (rasping system with windrow composting) system having: a 120-cu m refuse bunker, the usual magnetic separators for cans and scrap iron, hand separation of noncompostable materials, a D-O rasping machine and ballistic separator for the inert materials. The entire plant is in one building and has available a 4,000-sq m composting field. An important difference from other plants is an incinerator with a special grate built by the Esslingen Machine Works which provides greater capacity than the ordinary vertical furnace. The 1- to 1½-ton per hr furnace permits the burning of large quantities of industrial wastes and does away with the tedious sorting of material on the conveyor belt from the grinder. This type of combination plant is suitable to the needs of a middle-sized city where it is impossible to solve the total refuse problem by composting alone. Final judgement about its operation must await a long period of operation, with some technical improvements to be made in composting and incineration operations.

65-0291
Refuse reclamation plants. The Indian and Eastern Engineer, 107:476, July 1965.

Westinghouse Electric Corporation has developed a new process by which refuse wastes can be processed in a swift, inoffensive, silent, and invisible manner into useful and marketable forms. The process involves housed 'light industrial' plants which reclaim garbage rather than destroy it. After marketable items in the garbage have been screened, remaining objects are pulverized and ground, and then fed into a six-cell digestor section. Here refuse decomposition is accelerated by accurate control of moisture and temperature. The finished compost is a good organic soil conditioner. There is no ash produced, and everything that the salvage compost process manufactures is useful. Another possible benefit from the process lies in the fact that the sewage sludge can be used to moisten the material that is to become compost.

65-0292
Rose, W. W., J. E. Chapman, S. Roseid, et al. Composting fruit and vegetable refuse. Compost Science, 6(2):13-15, 17-25, Summer 1965.

The results of a preliminary investigation in 1961 indicated that composting offered a feasible and esthetically acceptable method for disposal of high-moisture wastes, such as fruit and vegetable solids. Dry materials, such as municipal compost or rice hulls can be used to absorb the moisture from fruit waste solids. The optimum initial moisture concentration was 60 to 65 percent. Grinding the fruit shortened the time required for stabilization of composted unground fruit. Aerobic conditions were maintained by a turning schedule. The initial low pH of the fruit compost mixtures appeared to be the cause of an initial lag in development of desirable microbial flora. Of the dry mixtures used, municipal refuse composted by the Dano Process and rice hulls performed satisfactorily. Bin-composting studies were continued during 1962 to test the performance of various dry materials in the compost mixture, and the effect of periodic additions of fruit waste was studied. Biological decomposition proceeds most rapidly at thermophilic temperatures, and the removal of moisture by evaporation is maintained at the highest rate of decomposition. A water extract of the compost contained a heat-stable substance inhibitory to spore germination. The results of the investigations indicated the feasibility of composting as a means of disposal for high-moisture fruit and vegetable wastes. There was an absence of odor and fly problems. Because of the 85 percent moisture content, the evaporation during the composting and drying produced large weight and volume losses in the initial mixture. Chemical additives such as lime and urea produced a more favorable environment for microbial growth. The stabilization of wastes decelerated with subsequent waste additions. Savings in time and labor would result if the compost could be aerated by injection of air. The 1964 study will determine the effect of the compost process on pesticides.

65-0293
St. Petersburg, Fla., to build composting plant. Compost Science, 6(1):10, Spring 1965.

The City of St. Petersburg, Florida, entered into a contract with Sacs, Inc., to finance, construct and operate a 105-ton per day composting plant. Very rigid performance specifications were set. The City Manager estimates that the plant will be under construction by the end of June 1965, and completed by the end of June, 1966. Sacs, Inc., was the low qualified bidder with a per ton cost of $3.25. Westinghouse Electric is designing the plant. The original bids specified as 20-year contract for processing system that was completely enclosed, and free from noise, odor, and dust conditions. Open windrowing will not be permitted. Products offered for sale will contain no pathogenci organisms and will not reheat upon standing nor cause odors.

65-0294
Sanford, C. F. Elmira to try composting. American City, 80(7):93-94, July 1965.

Elmira, New York, has signed a contract with National Organic Corporation at Atlanta, Georgia, to compost 20,000 tons of refuse per year at $4.35 per ton. The corporation assumes the risk and finances the plant thereby staking its reputation on the venture. Presently Elmira spends $117,000 per year for refuse disposal, and the estimated cost under composting will be $87,000 per year. The plant will cost the corporation $650,000 to build.

65-0295
Schaffer, H. And Jersey keeps on composting. Compost Science, 6(1):14-15, Spring 1965.

Jersey, the 45-sq mile island between Britain and France, has a waste conversion plant which converts both sewage and household rubbish into fertilizer. This was the result of its two main sources of income--holiday traffic and agriculture--demanding more effective waste disposal. The discharge of sewage into the sea was impractical because of ocean currents carrying it back to the beaches, and the incineration of rubbish was equally unsatisfactory. There was an urgent need for fertilizer for Jersey's two main crops, tomatoes and potatoes. All of the island's organic wastes are converted and utilized on the land. At first there was opposition to this, but, with the substantial improvement in crops, it became widely accepted. The compost was found to be richer in the trace elements and contained several antibiotics, and, in addition, controlled the eelworm, a nematode which attacks both potatoes and tomatoes. A reclamation of wasteland has resulted, the compost being used to create gardens on virtually pure sand. Sewage sludge is brought from the sewage plant where the conventional treatment by sedimentation and bio-aeration takes place. It is then mixed with the compost before it passes through the fermentation cells. A purified effluent, rich in nitrogen, is piped to the compost plant and added to the compost.

65-0296
Schulze, K. L., V. Brown, J. Houser, et al. Composting (Panel). In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Ohio, Sept. 1965. Ohio Department of Health. p.M-1 to M-38.

The criteria for design and operation of a successful commercial composting plant are: an acceptable aesthetic appearance; air pollution must be considered in site selection along with the economics of the haul. Slides were shown of a pilot plant and its components. In order for a plant to become economically feasible in any city, the city must be willing to pay for the service on a substantial basis. The successful commercial plant will be improved. The Fairfield-Hardy Digestor, a patented device for converting garbage and refuse, sanitary sludge, and animal and other waste into a usable compost or soil conditioner, is described. The digestor can be fed continuously or intermittently and operates completely in a thermophilic environment. Automatic controls to regulate and record the temperature and oxygen requirements are available. Wet pulping and dry grinder systems are used. The components were shown in slides. The history of the International Disposal Corporation is traced. The patented aerobic process involves grinding and preparing to form a somewhat homogeneous material which is fluffed, aerated, and in 3 days re-ground to a finer size to allow decomposition. After 6 days it is again ground and prepared for marketing. It can be sprayed as a germination base for grass seed and later decomposes as a soil conditioner. This is a completely nuisance free, reliable, and economical method of refuse disposal. The height and duration of temperature required for the composting process are discussed. Public health dictates that compost containing feces be subjected to continuous temperature of 140 F for at least 5 days. The difficulty arises in ensuring that all of the material reaches this temperature. Several European plants are described and pictures shown.

65-0297

Schulze, K. L. Composting as a waste disposal method. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.L-2 to L-13.

Data is presented on the garbage to be disposed of in the United States and the methods used by American cities. There is no city which composts garbage on a full scale basis. Cases of composting plants operated privately and which have failed are given. Two reasons were: the idea of large profits dominated the enterprise, and unsubstantiated claims as to the value of the product were made. The composting plant in use in Holland is described. The biochemistry involved in the decomposition of organic waste material is described in detail: basic oxidation equation, the bacteria, a temperature-time curve, and the effect of moisture content on the activity of the compost. The quantitative aspects of the process were investigated by using a rotating cylinder made from Lucite and having a capacity of 15 to 20 lb of raw garbage. The oxygen consumption per gram initial volatile matter per hr and the changes in this oxygen consumption rate with temperature, and with different mixtures were recorded. The data showed that during the thermophilic phase air had to be supplied at a rate of about 14 cu ft per minute per ton of volatile matter in order to satisfy the demand. A controlled continuous supply of feed material and air with controlled moisture ranges to maintain a composting process continuously in the thermophilic phase was tried. This would result in higher efficiency of the process and greater sanitary safety. The combination of dewatered sludge and garbage to be disposed of by composting is discussed.

65-0298

Schulze, K. L. The Fairfield-Hardy composting pilot plant at Altoona, Pa. Compost Science, 5(3):5-10, Autumn-Winter, 1965.

The Fairfield-Hardy composting pilot plant at Altoona has demonstrated on a full-scale basis that it is possible to operate a mechanical composting unit continuously in the thermophilic phase, i.e. at a temperature range between 130 and 175 F, and to produce a sanitary compost which is free from obnoxious odors and does not attract flies or rodents. The process consists of pulping raw garbage in a wet pulper, dewatering the pulp in a screw press to about 75 percent moisture, and then windrowing the dewatered pulp from a period of at least 2 months. After that, the compost is pelletized and flash dried in a heated rotating drum. The end product is a very uniform brown granular material which is sold as an organic base for fertilizer production. The wet pulper consists of a 6 ft diameter stationary steel bowl equipped with a rotating steel plate at the center of the bottom. The plate is studded with specially hardened steel teeth. So far, only air dried digested sludge has been used; however, there is little doubt that raw or digested sludge, which has been dewatered by vacuum filtration of centrifugation, etc., can be composted in the Fairfield-Hardy unit.

65-0299

Spohn, E. Glass in compost. Staedtehygiene, 16(6):129-134, June 1965.

The popular belief that glass in compost is less sharp-edged made us look into this matter more closely. First, the literature was scanned for previous findings on the decomposition of glass.

An article by Oberlies and Pohlmann, on the effects of microorganisms on clay, cites twenty authors who dealt with bacteria attacking silicates. As early as 1913 Basalik made extensive experiments by growing cultures of bacteria on silicates such as feldspar, mica, olivine, etc. He measured the decomposed amounts and found that their magnitude depended on the kinds of bacteria used as well as on the silicate material. Oberlies mainly investigated the attack of microbes on optical glasses. According to Rohde not only bacteria attack glass but also lichens and fungi. Schatz found that acids are not involved in the chemical decomposition process but complex metal-organic compounds. The present authors conducted experiments to see how fast glass is attacked in a waste composting process. In mulch, no biological decomposition can be expected because of the rapidity of the process. Polished glass plates were put among the waste layers and subjected to a regular composting process. After 3 months, the glass plates had blunt oval pits in a chain like arrangement. The pits had a diameter of approximately 0.5 to 1 micron, their depth was 0.25 micron. Scratches in the glass plate had been attacked more heavily. This observation leads to the conclusion that sharp edges and tips are attacked first and more strongly, which confirms the popular belief stated in the beginning. Nineteen microphotographs of glass surfaces are reproduced. (Text-German)

65-0300
Stirrup, F. L. Composting. In Public cleansing; refuse disposal. Oxford, The Institute of Public Cleansing, 1965, p.72-86.

Composting is used for providing feed for impoversihed soil, disposing a large portion of refuse, and disposal of sewage sludge. Humus gives soil good texture and pervents erosion. There is a breakdown of organic matter by bacteria and fungi under aerobic conditions. Different systems and processes are described. The Indore process alternates layers of straw and dried vegetation with layers of manure. The Dumfries system in inside a covered plant. The Jersey system has a plant of six stories and maturing sheds. The Dano process uses hoppers and bio-stabilizers. The Beccari process has an initial anaerboic breakdown in sealed tanks followed by a partial aerobic process. The Verdier process draws air from top to bottom and sprinkles with water or liquid sewage. In the 'Biotank' process refuse is ground to reduce volume and thoroughly mixed. Innoculants containing microorganisms assist fermentation. Bristol uses the Prat system where special attention is paid to aeration. Refuse in the 'VAM' refuse disposal system is sprayed with water containing a bacterial innoculant. There is revenue from by-products and the product itself if the compost is free from contraries. Growers have requested both finely ground and coarse material. A pH value of 8 to 9, and a carbon-nitrogen ratio of 20:1 is a basic guide.

65-0301
Summary of 1964 field scale composting studies. Compost Science, 6(2):25, Summer 1965.

The specific aims of the 1964 Field Scale Composting Studies were the investigation of materials handling problems, comparison of forced aeration of windrows vs. aeration solely by mechanical turning, and the effect of composting on pesticides. In investigating materials handling problems associated with the collecting, grinding, and distributing of fruit waste to the windrows, a two-sectioned concrete reservoir was constructed to contain the solid waste as hauled from a cannery and the fruit waste after grinding. Upon passage through the grinder, the fruit waste was reduced to a pulpy consistency which appeared to be pumpable. In testing forced aeration, two stationary windrow walls were constructed on the asphalt surface, containing a 30 cu yd mass of rice hulls. Forced aeration of one windrow was accomplished by imbedding perforated copper pipe beneath the asphalt surface. Air was supplied by a positive displacement rotary blower. Both windrows were mixed after the addition of fruit waste by a windrow turner.

65-0302
Teensma, B. Guidelines for composting raw ground refuse. Compost Science, 5(3):26, Autumn-Winter 1965.

Guidelines for composting raw ground refuse, based on the experiences of the Dutch compost plants, are provided.

Compost windrows should not be higher than 2 m, and the tops should be rounded or roof-shaped to permit rain runoff. The windrows must be separated and the area well drained to avoid puddle formation after rains. The moisture content of the raw refuse at the time of stacking must be between 50 and 55 percent. The interior of all windrows must be checked every week. When zones have been formed, the windrows must be turned (every 2-3 weeks) and checks must be continued after turning. As soon as new zones form, turning will need to be continued until they disappear. When this stage is achieved, the compost is finished and may be piled in large stacks. The use of a belt conveyor with a nail covered concussion mill as a turning machine is recommended, as well as an addition of 10 to 20 percent by volume of ripe compost or peat to the raw refuse.

65-0303
$300 million for non-farm fertilizer. Compost Science, 5(3):15, Autumn-Winter 1965.

Today the U.S. non-farm fertilizer market has a value of $300 million--$157 million from home gardeners, plus $143 million from professional landscapers, parks, etc. Non-farm fertilizer use has grown at the rate of about 10 percent per year since 1960, with major growth occurring in California, Texas, Florida, the Northeast and East North Central areas. About 25 percent is sold in garden centers, 20 percent in hardware stores, 10 percent in discount and department stores. Organic fertilizers comprise one-third of the fertilizers sold on a tonnage basis.

65-0304
Toward a healthy solution for waste problems. Compost Science, 6(2):3, Summer 1965.

The developments concerning the safe disposal of waste products are reviewed: New disposal methods are rapidly being sought for the 4½ lb of solid wastes that the average American produces each day. Congress is now considering the $43 million Solid Waste Disposal Act, which will provide for evaluation of such new approaches to garbage handling as large-scale composting. The Solid Wastes Composting Research and Demonstration Project sponsored by the Tennessee Valley Authority and the Public Health Service provides for a full-scale demonstration composting plant to be designed and uilt within the next year in a city located in the Tennessee Valey area. Houston, Texas, will soon have the greatest number of and the largest composting plants of any U.S. City with three companies submitting contracts for plant construction. In Mobile, Alabama, a 300-ton per day compost plant which will treat refuse and sewage sludge is being constructed. In Brooklyn, New York, a compost plant was formally opened utilizing a digester which had been handling 15 tons of restaurant food waste per day. Other cities, where plants are now operating or will soon be built, include: Altoona, Pennsylvania, St. Petersburg and Largo, Florida, Wilmington, Ohio, and New Orleans, Louisiana. The Solid Waste Disposal Act now before the Congressional Committee on Interstate and Foreign Commerce proposes authorization for: a national research program on improved methods of solid waste handling and disposal, technical assistance to state and local governments, matching funds for demonstration projects, and training.

65-0305
Visser, S. A. Decomposition of organic materials in the tropics. Compost Science, 5(3):27-29, Autumn-Winter 1965.

In Uganda, about 15,000 sq miles are covered with tropical swamps of which only 225,000 acres are suitable for reclamation. A research team has investigated the properties of the peats and the processes occurring in them for the remaining 14,649 sq miles of swamps. About 60 percent of the vegetation of the swamps consists of Cyperus papyrus, the greater part of which decomposes where it grows. Three types of samples were investigated: (1) dried papyrus together with various additives, decomposing in vitro; (2) dried papyrus and various additives, contained in baskets of fine nylon gauze, which were left to decompose in natural papyrus swamps; and (3) peat core samples from deep natural papyrus peat deposits with depths of over 10 m. In type 1, the components forming the gas mixture, as read daily from a calibrated gasometer for 1,200 days, were found to be methane, carbon dioxide, hydrogen, and traces of carbon monoxide and ethylene. The methane content appeared to increase with progressing fermentation. The microflora, and particularly the ammonifiers and denitrifiers, were found to be highly active. In type 2 the amounts of fats and waxes were of the same order for all the samples investigated. The alcohol extracts showed values as much as five times larger than those obtained with other solvents. Both the carbon and nitrogen contents of the mixtures increased during decomposition, but the C/N ratio decreased, as did the fulvic acids. In type 3 the nitrogen content decreased with the depth of the sample but the C/N ratio increased after an initial drop, while the fulvic acids showed the smallest change with depth. Very rapid decreased in depth were noticeable among the microflora.

65-0306

Weinburgh, H. B. Composting; sanitary disposal of wastes. Atlanta, Ga. U. S. Department of Health Education, and Welfare, Communicable Disease Center, 1965. 32 p.

Research has shown the feasibility of composting municipal wastes. Proper aerobic, thermophilic composting produces the time-temperature conditions required for pathogen destruction. Composting costs are similar to those of the sanitary landfill and less than those of incineration. Composting produces a humus capable of improving poor land at the rate of 1 acre per 10,000 persons per day. The aerobic and anaerobic decomposition of organic matter is described. Factors affecting composting include refuse sorting and grinding, carbon/nitrogen relationship, moisture content, placement of materials, temperature, aeration, mixing, climatic conditions, nitrogen conservation, and composting time. The unit processes of a city composting plant are refuse reception, salvage separation and preparation, compost preparation, decomposition and stabilization, and market preparation. Methods of composting on farms are reviewed. Selected references are appended.

65-0307

Weinburgh, H. B. Decomposition of organic matter. In Composting; sanitary disposal of wastes. Atlanta, Ga., U.S. Department of Health, Education, and Welfare, Communicable Disease Center, 1965. p.3.

In aerobic stabilization, bacteria, fungi, and actinomycetes, which use oxygen, feed on the organic matter and develop cell protoplasm from the nitrogen, phosphorus, some of the carbon, and other required nutrients. It the excess of carbon over nitrogen in organic materials being decomposed is too great, biological activity diminishes and the process is slowed. When the ratio of carbon to nitrogen is too low, excess nitrogen is released in ammonia. Under favorable conditions some of the excess nitrogen may be oxidized to nitrates. There are no disagreeable odors produced in the aerobic process when adequate oxygen is available. If the organic material is in a pile or otherwise arranged to provide some insulation, the temperature during fermentation will rise to over 158 F. If the temperature exceeds 150 to 160 F, bacterial activity is decreased and stabilization is slowed. Putrefactive breakdown of organic material occurs anaerobically. Anaerobic bacteria use nitrogen, phosphorus, and other nutrients in developing cell protoplasm, but reduce the nitrogen-containing compounds to organic acids and ammonia. The carbon not used in cell protoplasm is liberated mainly in the reduced form as methane.

65-0308

Weinburgh, H. B. Sanitary and agricultural aspects. In Composting; sanitary disposal of wastes. Atlanta, Ga., U.S. Department of Health, Education, and Welfare, Communicable Disease Center, 1965. p.3-6.

The destruction of pathogens and parasites is an important aspect and problem of composts containing contaminated materials. Aerobic composting at high temperatures is effective in destroying these organisms. The high temperature zone usually extends only to within 4 to 8 in. of the surface and turning the outer material to the center is necessary to insure pathogen and parasite destruction. When materials attractive to flies are composted, some of the larvae will move to the outer cool areas and continue their life cycles. Frequent turning of the outer layers into the center is effective in destroying eggs, larvae, and pupae. Humus from manure and garbage contain some nitrogen, phosphorus, potassium, and trace elements but the amounts are too low for classification as fertilizer. Humus has desirable characteristics in addition to nutrients. The organic acids produced combine with phosphates in a form readily available to higher plants. Both phosphorus and nitrogen are involved in a storing effect. The humus may also contribute to increased nitrogen-fixation in the soil from nitrogen in the air. Compost is much more valuable for its physical effects on soil than for any chemical nutrients it may add. It improves soil structure and lessens wind and water erosion. The high temperatures of aerobic composting destroy viability of weed seeds.

65-0309

Weinburgh, H. B. Factors affecting composting. In Composting; sanitary disposal of wastes. Atlanta, Ga., U.S. Department of Health, Education, and Welfare, 1965. p.6-15.

Removal of salvable and non-compostable materials is usually necessary. Grinding the raw material renders it more susceptible to bacterial invasion, produces beneficial initial aeration, and assists in homogenizing the material. The initial aeration, and assists in homogenizing the material. The initial C/N ratios of some composting materials are listed. Aerobic decomposition can proceed at any moisture content between 30 and 65 percent if adequate aeration is provided. The material in aerobic compost piles should be loosely stacked. Five to 6 ft is about the maximum height for any material and 3½ to 4 ft is the minimum. Decomposition proceeds much more rapidly in the optimum temperature range, 120 to 160 F. The frequency of aeration or mixing and the amount of aeration or the total number of turns are governed primarily by the moisture content and the type of material. Mixing at frequent intervals during the first 10 to 15 days of aerobic composting achieves about the same degree of stabilization as making the same number of turns over a longer period. Climatic conditions, particularly temperature, wind and rainfall, influence the composting operation when using windrow, piles, or stacks. Nitrogen can be lost be leaching, but the major loss comes from the escape of ammonia or other volatile nitrogenous gases. A material with an initial C/N ratio of 30 to 50 (moisture approximately 70%) can be stabilized in a period of time from 10 to 16 days. Compost can be tested and judged on the basis of temperature, moisture, appearance, odor, pH, and maturity.

65-0310

Weinburgh, H. B. Methods and planning for cities. In Composting; sanitary disposal of wastes. Atlanta, Ga., U. S. Department of Health, Education, and Welfare, 1965. p.16-26.

Factors to be considered in the analysis and planning for the establishment of a plant to compost city wastes are listed. The unit processes in large scale composting plants are: reception of the refuse; sorting and preparation of the salvable material for sale; preparation of the compost (shredding, pulverizing, or screening to facilitate decomposition); decomposition or stabilization to reduce C/N ratio, to destroy pathogens, parasites, and weed seeds, and to control fly breeding; and preparation for the market (final grinding and bagging). The many different finds of grinders and shredders include: swing hammers, rigid hamers, shredders with rigid bars and either spring or weight loader breakers, cutters or chippers, mills, wet pulpers followed by presses, crushers, rasps, and slowly rotating drum mills. The types of composting methods that have been used are: pits or cells, windrows or stacks, and vertical or horizontal enclosed digesters in which the refuse is mixed and aerated mechanically. The Dano, Naturizer and Jersey processes are described in detail. Comparative costs of enclosed mechanical digester and windrow composting operations are listed.

65-0311

Weinburgh, H. B. Methods for farms. In Composting; sanitary disposal of wastes. Atlanta, Ga., U.S. Department of Health, Education, and Welfare, Communicable Disease Center, 1965. p.27-28.

A farm seldom has enough manure and litter to build, at least once a week, an individual compost stack large enough to maintain high temperatures. The size and number of stacks to be used depends on the amount of manure and waste available. Stable manure is made of three main components: bedding or vegetable-matter litter, solid excreta, and urine. Stable manure in a fresh condition contains about 70 to 80 percent moisture. A compost pit can be built of concrete or masonry. The area sould be such as to provide the desired volume when the pile of material to be composted is 4 to 5 ft high (inside measurements about 8 ft by 8 ft). It is desirable to have a concrete or masonry slab under a composting stack and a sump for catching the drainage. Coarse cellulose material (straw, corn or can stalks) on the bottom of the stack is essential for retention of nutrients and development of humus. The cellulose layer should be at least 12 to 18-in. deep so that it will pack to no less than 3 or 4-in. Any type of organic litter can be added to the manure pile and composted increasing the amount of humus and decreasing nitrogen loss. Poultry manure can be composted by removal to a compost stack or composted under the cages. It is necessary to aid cellulose litter to increase the strength of the material to maintain the stack, to improve the C/N ratio, to increase porosity for aeration, and to absorb ammonia, moisture, and odors.

65-0312
Weinburgh, H. B. Summary. In Composting; sanitary disposal of wastes. Atlanta, Ga., U.S. Department of Health, Education, and Welfare, Communicable Disease Center, 1965. p.29-30.

The three approved refuse disposal methods available to a municipality are sanitary landfill, incineration, and composting. A composting plant should be capable of accepting almost everything that is delivered. The market value of compost compares favorable with that of a good farmyard manure on a weight for weight basis. Since refuse disposal is an accepted municipal responsibility, composting should be considered by the municipality as a refuse disposal method, rather than a method for supplying an agricultural need. Selling only part of the product at a very high price provides no solution to the overall disposal problem. The overall cost of a refuse composting plant will be more than that of a sanitary landfill, but less than that of an incineration operation. The construction costs of a full-scale compost plant for a city of 120,000 would be about $435,000 to 560,000. The operating and amortization costs of a mechanical composting plant for a city of 30,000 were estimated to be about $4 per ton of mixed refuse, after deducting revenue from the sale of salvage (about $3 per ton of refuse). Adequate operation of a hygienic composting process requires hiring of a consulting engineer to design the plant, the designing and constructing of a compost plant suited to the particular needs of the municipality, and having a qualified supervisor on the job from the beginning.

65-0313
Wiley, J. S., and O. W. Kochtizky. Composting developments in the United States. Compost Science, 6(2):5-9, Summer 1965.

The alarming rate of increase in the population (doubled by 2,000) and the increase in per capita refuse production (now about 4.5 lb per capita per day) together create a formidable problem. Most of the population growth will be in cities and their surrounding urbanized areas so the available land for ultimate disposal of refuse will become reduced. The increase in volume of refuse is far greater than the increase in weight, and the greatest increase is in low-density combustible rubbish, mostly paper and plastics. Garbage and ashes are slightly reduced in quantity. Many cities now using dumps will have to reduce the volume of their refuse to conserve land areas. Burning, garbage grinding, salvage, and composting are methods to reduce volume. The calorific content is increasing but the nutrient content, of importance in composting, is decreasing. The composting plants in Altoona, Pennsylvania; Largo Florida; Norman, Oklahoma; Phoenix, Arizona; Sacramento County, California; San Fernando, California; Springfield, Massachusetts; Williamston, Michigan; and Wilmington, Ohio, are described and the technical problems in their operation discussed. Houston's installation is described. A proposed TVA-PHS research and demonstration plant is mentioned.

65-0314
Word of caution from Kingston, Jamaica. Public Cleansing, 55(2):103, Feb. 1965.

A composting plant, using part of the Kingston, Jamaica, refuse has met with financial difficulties. The plant, sponsored by the National Organic Corporation of Atlanta, Georgia, now holds 1/10 instead of the projected 1/3 of the city's 220,000 tons of annual waste. The Corporation originally offered to pay the city for its refuse at $0.15 per ton of compost produced, but has now asked a subsidy from the city to offset financial difficulties. The nutritional value of the compost was too poor for fertilizer, and it has been difficult to find a local market among cane farmers.

REDUCTION

65-0315
Bopp, R. A new machine for shredding bulky waste. Schweizerische Bauzeitung, 83(6):94-95, Feb. 11, 1965.

Bulky waste can hardly be burned or composted without crushing or shredding it first. For this purpose a new waste shredding machine has been developed by the company Von Roll AG., Zurich. The new machine is capable of shredding all the various kinds of bulky wastes automatically. Its capacity varies between 120 and 200 cu m per hr. The large horizontal input opening of 3 by 3.4 m makes loading simple. The machine consists of two steel frames joined together. The stationary frame has seven parallelly arranged sectional iron supports spaced one foot apart with blades screwed to their edges. The movable frame has two rakes, each made of 3 beams which are connected by a horizontal member. Two hydraulic cylinders move the rakes whose beams fall into the spaces of the stationary frame. The bulky waste is caught by the blades and minced. The movement is slow but very powerful and almost noiseless. The motor power is low, only 37 kW are required. The machine takes any kind of bulky waste. Since all forces arising in the shredder are taken up by the structure of the machine, the foundations need to support only the weight of the shredder which is 28 tons. Besides the crane operator no other personnel is needed. The shredding machine is shown in a photograph and a technical drawing. A smaller machine with an input opening of 3 by 1.55 m is also available. (Text-German)

65-0316
Can/bottle crusher. Modern Sanitation and Building Maintenance, 17(10):48, Oct. 1965.

'Crush-all' provides 17 tons of pressure to crush cans with both ends in place--like juice cans which have only been punctured. It handles cans up to 5 quarts and bottles up to 1 gal. Since operation is by a start-stop switch, no operator training is required.

65-0317
Clippers counter Cleo debris. American City, 80(2):36, Feb. 1965.

Miami Shores, Florida, had to place two new brush chippers into operation to clean up the brush debris left in the wake of Hurricane Cleo. The chippers reduce the bulky brush to as little as one-fifth its original volume and shoot the debris directly into truck boxes.

65-0318
Combs, W. H., and S. N. Craig. Waste disposal methods - part I - pulping. Modern Sanitation and Building Maintenance, 17(9):15-17, Sept. 1965.

Incineration is the most used method of disposal but it only gives 95 percent reduction in volume of loose non-compacted burnable material. Incineration contributes to air pollution. Balers require labor to segregate materials since baling implies sale of accepted salvage. By using a hogger or shredder and blower with a baler, an automated system can be developed, but this proves undesirable if high dust and noise levels are a problem. Also, metal separation must be nearly 100 percent to avoid the hazard of dust explosion. Garbage grinders are excellent for food wastes, providing silverware and paper is kept out of the meshing parts. The pulping system consists of two parts: a pulper and a waste extractor recirculator. The pulping unit is basically a tank with rotating impeller, recessed below the contour of the tank itself making it non jamming. A row of cutters permits tearing of nonpulpables, which are mixed with general wastes. As it is chewed small enough to pass through the screen, it is pumped as a slurry of 2 percent solids to the water extractor. Heavy nonpulpables are separated by a combination of centrifugal force and gravity and settle in an opening in the bottom of the tank and emptied. Material in the form of slurry is pumped to the Hydra-extractor. The material is squeezed to remove additional water. The system provides an 80 percent reduction in volume.

65-0319
Eases waste disposal. Food Engineering, 37(6):112, June 1965.

An automatic, low cost refuse disposal system, which processes 1,000 lb per hr of paper, packing material, food wastes, glass and metal was developed by the Somat Corp. It produces a semi-dry pulp reduced to about 10 percent of original volume. The unit also lowers in-plant handling and maintenance, provides a cleaner, relatively quiet operation, and improves safety. The pulper, which is schematically illustrated, is a tank with a rotating disk in its bottom. Metal and glass fed to the pulper are separated from pulpable refuse by centrifugal force and gravity. Cans are normally reduced to about 75 percent initial volume and glass is shattered completely. A brewery which destroys up to 20,000 lb of beer cartons a day sells the pulp to a nearby roofing company, but savings are experienced when handling as little as 100 lb a day.

65-0320

Gondard plant for Haarlem. Public Cleansing, 55(7):386-387, July 1965.

Haarlem has decided to use three Gondard refuse reducers in order to utilize its municipal refuse. Pulverized material from a Standard Gondard Refuse Reducer is fed to two Gondards where it is reground. These machines are set at a throughput of 12 tons per hr, which allows for the collection at Haarlem which is about 100 tons per day. The entire Gondard installation is mechanized.

65-0321

Greenway, W. F., and J. Farnell. Refuse pulverising plant for Welsh Authority. Surveyor and Municipal Engineer, 126(3826):19-20, Oct. 2, 1965.

The Mountain Ash Urban District Council has solved its waste disposal difficulties by installing a Volund rotary refuse pulverisation plant to serve its 16.5 sq miles of urban population. The past practice of tipping has been abandoned in consideration of its serious deficiencies: fire outbreaks, fly infestation, child trespass, and sheep trespass to tips as a feeding ground. After considering alternative methods of disposal, the Council chose pulverisation because it provides a material for landfill which prevents nuisances normally associated with refuse tips. The pulveriser has a capacity of 10 tons per hr. The plant is centrally located, so that maximum haulage distance is about 4 miles. A brief description of the plant's operation is included. Crude refuse is conveyed from a 60 cu yd hopper to the pulveriser, while salvage is collected by hand from the refuse on the conveyor belt. The rotary screen of the pulveriser leaves the refuse in three sizes for storage hoppers. The whole plant is centrally controlled. Fifty adjoining acres should serve as a disposal site for about 40 years. The site layout includes a 30 ton public weighbridge and an amenity welfare block for employees. Capital costs should be about £74,500; operating costs are estimated at £9850 p.a. Householders have been provided with a bin of 2 sq ft capacity to improve domestic storage and facilitate conditions for collectors.

65-0322

Low cost refuse compaction by wet drum. Engineering, 200(5200):791, Dec. 17, 1965.

A refuse conversion plant, which passes the refuse through a rotating pulverizer drum and introduces water to break down fibrous materials like paper and cardboard, is described. The plant has a nominal capacity of 45 tons per day and is based on a cylindrical 8 ft diameter drum, 29 ft long, carried in a frame and rotated at 11½ rpm. The drum is charged with refuse through a hopper and single loading throat and then water is introduced by a metering pump to give a moisture content of about 40 percent. Flight plates on the inside of the drum elevate the refuse through a large fixed crushing cone which forces it further forward. Pulverizing occurs in the first 12 ft of the drum under the action of segmental steel deflection plates; the refuse then passes into the screen section and annular void and then to discharge. Design throughput rating is 7½ tons per hr and discharge is continuous. The product from the drum is peat-like in appearance and ready for covering a rubbish dump. The plant and process are simple and inexpensive, with the costs, including dump operation, below 10s per ton for the first 7 years if the plant is rented. Another feature is that when a dump is full the plant can be easily moved to another site.

65-0323

Mobile balers. Waste Trade World, 106(16):9, Apr. 17, 1965.

Mobile baling presses which are simple to load and operate, and process a wide variety of waste materials, are marketed by Funditor Ltd., London. Three models are available, and one of these is described and illustrated. It can be operated with press button simplicity and left to operate itself in complete safety, enabling baling material to be assembled while a bale is being produced. The platen is actuated by a twin rack and pinions, giving a total thrust of 1½ tons. The thrust is applied by a one-third hp motor running at 950 rpm through a reduction gear mechanism. An average bale measuring 14½ by 35 by 75 in. takes about 6 minutes to produce.

65-0324

More about the Reno. Public Cleansing, 55(11):658-659, Nov. 1965.

The Reno refuse collection vehicle can provide a well pulverized refuse by the time it reaches the landfill. The vehicle is manufactured in Denmark and consists of three sections. These sections are combined by flexible links so that the driver's cabin, the outer skin of the body, and the rear end move independently of each other. The rotating drum container is fitted with internal vanes which guide and macerate the refuse. Revolution of the drum can be in either direction and at 45 rpm. Reversal of the direction of rotation will discharge the contents. A 400 liter water tank is attached for moistening the refuse during pulverization. Capacity is sufficient for a whole day's operation.

65-0325

New bottle breaking machine. Waste Trade World, 107(2):22, July 10, 1965.

Three improvements incorporated in the latest model of the 'Fortune' bottle breaking machine are described. The drive is now by means of a loose coupling which obviates the possibility of damage to the motor bearings in the vent of a strain taking place in the breaking unit itself, and eliminates the possibility of very fine glass dust getting into the motor bearings. Use of the hardest manganese steel available has also meant a much longer life from the breaking unit. The rubber baffle has now been moved up the tube to approximately 6 in. from the top which ensures that the next bottle being put in will push the previous one through, if by any chance it has become jammed. The delivery tube also has been lengthened and cranked to make it impossible for operators to get their arms into the tube while the machine is running. A standard model, which is designed for general use and can be fitted to any normal dust bin, and a cabinet model are available.

65-0326

New waste reduction systems. Waste Trade World, 107(1):9, July 3, 1965.

A new range of waste reduction machines has been introduced by Centriblast Corp. Centriblast disintegrators handle cardboard fiber, plastic, glass, metal, wood, rubber, leather, etc. materials, alone or in combinations. The heavy, reinforced crusher jaws compress containers to a fraction of their former volume. For high-speed crusher operations, opposing sets of heavy-duty steel tracks converge and crush the material. Speed of tracks may be regulated to create tearing action in addition to crushing. The output of the machines is not fluffy, but rather of a dense consistency resulting in efficient volume reduction of bulky waste. A wide range of units is available with horsepower ranging from 3 hp to 100 hp. The construction and operation of a standard machine is described. The company also supplies completely engineered systems to fit production or salvage requirements.

65-0327

Package contract. Public Cleansing, 55(9):519, Sept. 1965.

The Borough of Epsom and Ewell in Surrey has contracted for a refuse separation and pulverization plant on the Fermascreen principle. This system pulverizes, dampens and screens refuse in rotating drums and involves minimum maintenance and power consumption. It can also accept crude refuse without manual sorting. Pulverized material and rejects will be covered by hygienic compost in a sanitary landfill. The tins and ferrous metals will be separated and baled, preventing fly attraction.

65-0328

Poole, N. D. Waste disposers. In Consumers all--the yearbook of agriculture 1965. Washington, U.S. Government Printing Office, 1965. p.141-143.

A grinder in the sink is essentially a small metal cylinder or hopper with a motor to operate a pulverizer; it shreds food wastes and flushes them into the drain. In a batch-feed disposer, one puts the wastes into the hopper (one to two quart capacity), locks the cover, turns on the water and the electric switch. The food is then ground. In a double switch arrangement, one is turned on by locking the lid in position; the other is turned on automatically as water reaches an adequate flow. Neither starts the mechanism without the other. The continuous-feed disposer can be fed as it operates, but a stray bone or spoon may slip inside accidentally. Soft dough, liquid fat, and fibrous vegetables may require special handling. Wastes from a grinder will increase the load in a septic tank by one-third. The gas-fired incinerator consists of a heavy metal container with a grate, a gas burner, and an ash drawer built into the bottom. It requires a connection to the fuel and to a flue-fed chimney. Capacities range from 1.5 to 2 bushels. Afterburners consume smoke, fly ash, and odors. Ashes must be emptied often and non-burnable material removed from the grate to prevent clogging.

65-0329
Refuse-reduction plant saves landfill space. American City, 80(11):92-93, Nov. 1965.

A new plant, just outside Montreal, can process 500 tons per day, reduces bulk by 65 percent (including salvage) and changes the nature of the refuse. The refuse is collected by 20-ton compactors that discharge either into the conveyor hoppers or into an adjacent storage pit. There are three 8 hr or two 10 hr shifts. Seven trucks can dump at the same time. A pan conveyor moves the refuse from the hopper onto the conveyor belts which carry it to a sorting room on the second floor. Currently, metal, paper, rags, and glass are salvaged and baled. Refuse weight is reduced by 25 percent and bulk by 40 percent by the current operations. The non-salvageable material passes to crushers. Two hammermill units each have four 12-hammer rows of 15 lb swing hammers revolving at 1,200 rpm. All uncrushable material is rejected ballistically. Costs are estimated to be $1.50 to $2.00 per ton for operation or, if capital is included, about $3.00 per ton. One half will be recovered by salvage.

65-0330
Reno II. Public Cleansing, 55(10):564-566, Oct. 1965.

The principle behind a new type of refuse collection vehicle is explained. The Reno II contains a 10-cu yd continuously rotating drum with vanes which partially pulverize the refuse and impell it towards the front of the system, wets and compacts the refuse so little cover is needed at the tip site. Capacity of the truck is 400 bins in one load of about 5 tons.

65-0331
'Seerdrum' refuse conversion plant. Engineer, 220(5731):897, Nov. 26, 1965.

The 'Seerdrum' refuse conversion plant at Wheatley, Oxfordshire, is described. Domestic rubbish is fed into the drum, which is 8 ft in diameter and 29 ft long, and rotates at 11½ rpm. After 45 minutes the product and rejects are disgorged. The product is a broken-down, inoffensive material like young leaf mould; the rejects comprise tins, rags, plastics, and rubble. At the loading end a metering pump introduces water into the charge to bring its moisture content to about 40 percent. This moisture is instrumental in reducing the strength of paper-based and fibrous constituents to facilitate easy breakdown during abrasion. The process is described in detail and illustrations are provided. Optimum capacity is 7½ tons per hr to 8 tons per hr and installed power 50 kW. Capital cost is much less than for alternative methods.

65-0332
Shayne, P. E., E. H. Taylor, and K. S. Watson. On-site development. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.D-1 to D-27.

A recent invention is a self-contained refuse compactor that compacts the refuse on site and eliminates air pollution, daily collections, extra personnel, and separation of refuse. Six basic types of detachable containers in the system are used. Containers are fire proof, animal proof, rodent proof, fairly free of flies and odors, and will hold more than trash cans. The cleaning of containers is a problem. The container itself can be improved. A major problem is trained personnel. Possible solutions to the problem include incorporating these wastes into the sewage system, and dissolving trash in acid. People must be made aware of the long-range problem, and must be educated in handling solid wastes. Facilities to handle solid wastes must be incorporated into new buildings, and financial support must be given for long-range projects. Advertising and public relations are proposed to accomplish these. The sack system removes the ontainer along with the contents. There is no permanent container to attract insects and other disease carriers. Odors, spillage, and noise are greatly reduced. A food waste disposer might be installed in each home and the food waste problem combined with the sewage problem. Slides were shown and the operation and economics of the disposer described.

INCINERATION

65-0333
Angenend, F. J. The state of waste incineration in the U.S.A. Brennstoff-Waerme-Kraft, 17(8):396-399, Aug. 1965.

This is a review of the 'Proceedings of the 1964 National Incinerator Conference,' ASME. The individual topics of this publication are briefly summarized. Some differences in European conditions are noted, such as the lack of interest in utilizing the heat generated by waste incineration. The level of the technology of waste incineration is somewhat higher in Germany than in the United States, but that much can be learned from the American experiences. Waste incineration needs more scientific research. (Text-German)

65-0334
Big incinerator nears completion. American City, 80(4):21, Apr. 1965.

Rockville, Maryland, is building an incinerator with three furnaces, each capable of burning 350 tons of refuse every 24 hr. The furnaces feature the largest traveling-grate stokers ever installed for a municipal plant.

65-0335
Bogue, M. D. Municipal incineration. U.S. Public Health Service, Dec. 1965. 27 p.

A brief review is given of the history of incineration, incinerator applications, a comparison of incineration and sanitary landfill, and the advantages and disadvantages of incineration. The elements of an incinerator system are the storage pit, the furnace, the combustion chamber, the subsidence chamber, a residue removal system, cranes, and fly ash removal equipment. Some incinerators will have forced draft fans and air pollution control devices such as wet scrubbers or cyclone dust collectors. General types of incinerators include: batch-feed cylindrical and rectangular furnaces, and continuous-feed furnaces such as rocking grate, reciprocating grate, traveling grate, rotary kiln, and ram feed. Factors which should be considered when locating an incinerator are: haul distance, central location, zoning, waste heat market location, clean water availability, expressway location, truck access, land availability, land cost, housing in immediate area, nuisance factors, foundation conditions, exposure to floods, availability of rail and water transportation. Continuous operation of an incinerator may save 15 percent or more in labor costs. Recent advances in incineration and elements requiring further study are listed.

65-0336
Boubel, R. W., G. E. Thornburgh, and B. R. Pavelka. A study of wood waste disposal by combustion and its effect on air quality in the Medford Area/Final Report. Corvallis, Oregon State University, School of Engineering, Engineering Experiment Station, Jan. 1, 1965. 60 p.

A study was sponsored by the Forest Industries Air Quality Committee of Associated Oregon Industries to better understand the effects of wood waste burning on atmospheric pollution levels. The study was conducted in a small valley area with a relatively large number of teepee waste burners and relatively poor quality air. Particulate emissions for the area were estimated and air quality measured for approximately 3 months. Teepee burners were found to contribute the great majority of particulate matter found in the atmosphere. The air quality of the area was generally unsatisfactory according to regulations of the state of Oregon. Test results indicated that the burners were capable of doing a reasonable job of consuming wood wastes if they were properly maintained and operated. The critical period was during start-up when low temperatures and correspondingly high excess air occured with the resulting excessive smoke and cinder discharge. The best criteria for smokeless operation is that the exit gas temperature be maintained within the range of 600 F to 900 F. A cost analysis for various disposal methods was made for existing teepee burners; modified and refined burners with temperature measuring devices; auxiliary gas fuel, and full draft control; multiple chamber incinerators with air cleaning devices; and spreader stoker electrical power generating stations. A bibliography is appended.

65-0337
Brandt, H. Cleaning of flue gases. Brennstoff-Waerme-Kraft, 17(4):190, Apr. 1965.

It is now possible to clean flue gases escaping from waste incinerators. While older incinerator plants annoyed the neighborhood by discharging charred paper and cardboard flakes, the newest electro-filters retain even the smallest particles of charred paper. A new recording instrument, 'Konitest,' indicates every change in the dust content of the flue gases. (Text-German)

65-0338

Coogan, F. J., and J. H. Stovall. Incineration of sludge from kraft pulp mill effluents. Tappi, 48(6):94A-96A, June 1965.

The disposal of sludge from pulp and paper mills has been a problem because of the land requirements and the nuisance from unsightly sludge ponds. The use of a sludge dewatering system and incineration system for a bleached kraft mill is described in which the total waste from a 540 ton per day of bleached board, coated and specialty papers facility are disposed of in an area of a few hundred square feet. The details, costs, and operating problems of the plant are described. The sludge was dewatered by passing through a clarifier (1.9% solids in sludge), a centrifuge (20% solids in cake), and a filter press (36% solids in cake). The filter press cake was fluffed up before going to the waste heat drier and cyclone where the solids were increased to 77 percent before being charged to the incinerator. A sketch is given of the pilot plant flow diagram and the mill waste treatment system showing the location of the sludge incineration system. Tables are given of the characteristics of the pilot plant wastes, the pilot plant operating data, and the operating costs of the incineration system. The dewatering and incineration system cost $158,000 and the cost of operation was $12.48 per ton of dry solids incinerated. The cost of operating the entire waste treatment system was $0.40 per ton of unfinished paper which was slightly higher than the costs for sludge lagooning alone.

65-0339

Corey, R. C. Definitions of terms used in incinerator technology. Informative Report No. 1. Journal of the Air Pollution Control Association, 15(3):125-126, 135, Mar. 1965.

The definitions given apply to conventional commercial, industrial, and municipal waste incineration practices. Typical of the definitions is: Fly ash--all solids including ash, charred paper, cinders, dust, soot, or other partially incinerated matter carried out in the products of combustion. The classification system for incinerators and the classification system for types of refuse are those adopted by the Incinerator Institute of America in the IIA Incinerator Standards of April 1963. The word waste refers to useless, unused, unwanted, or discarded materials including gases, liquids, and solids. Refuse, as defined, refers to solid wastes, such as garbage, rubbish, ashes, street refuse, dead animals, abandoned vehicles, industrial wastes, demolition wastes, construction wastes, sewage solids, and hazardous and special wastes. The classification of incinerators includes the type of wastes for which each incinerator class is suitable. For example, Class VI Incinerators (crematory and pathological incinerators) are suitable for Type 4 wastes which are composed of human and animal remains, consisting of carcasses, organs, and solid organic wastes from hospitals, laboratories, abbattoirs, animal pounds, and similar sources consisting of up to 85 percent moisture, 5 percent incombustible solids and having a heating value of 1,000 Btu per lb. This contrasts with Type I waste, which is rubbish consisting primarily of paper, cartons, rags, wood scraps, sawdust, etc. consisting of up to 25 percent moisture, up to 10 percent incombustible solids and having a heating value of 6,500 Btu which can be used in Class I, IA, II, IIA, and II incinerators.

65-0340

Easterlin, J. D. Complete combustion with minimum excess air. American City, 80(2):99-101, Feb. 1965.

Broward County, Florida, has a new incinerator which has two ram-fed furnaces. Detroit stokers are built to a tandem design, charging hoppers that can be loaded by crane or by truck, stationary crane controls, and a self-cleaning magnet that removes metal from residue. Several patented improvements include ash-removal and gas-scrubbing apparatus and portions of the material-handling and water-recovery system. The stack particulate emission rate is well below Florida standards.

65-0341

Flood, L. P. Air pollution from incinerators--causes and cures. Civil Engineering, 35(12):44-48, Dec. 1965.

A detailed report on specific and common causes of air pollution from incinerators and design factors which eliminate these causes is presented. The essentials are: high-temperature burning in turbulent air flow for sufficient time; use of 25 percent more air than theoretically needed, and no more; gentle, mechanical agitation of fuel bed; cleaning of stack effluent by electrostatic or other methods; high-stack to spread pollution and help create a draft; continuous feed to eliminate periodic excess air causing smoking; water cooling to allow high temperatures without slag formation; 3-shift operation to eliminate smoking and incinerator temperature-change stress at start-up and shut-down. Drawings of European plants following this formula are included.

65-0342

Gruenwald, A., and J. A. Reynolds. Less than $3,000 per ton. American City, 80(10):100-101, Oct. 1965.

Astute design and simple instrumentation helped to hold the construction cost of the new 250 ton per day incinerator in Ewing Township, New Jersey, to less than $3,000 per ton. The furnace itself contains a single combustion chamber above the horizontal traveling grate which rides on rollers to minimize wear. Underfire air enters through ten ports, double the ordinary number for this length of grate, to provide more even distribution and prevent blow holes. The result is the lazy flame, so important to air pollution control. Expansion changer velocity totals only 1,000 ft per minute at 1,800 F. Performance indicates that with this design no sprays are necessary in the flues. Low velocities allow the particles to precipitate in these chambers instead of being forced out of the stack. The building is constructed of concrete blocks framed in Bethlehem steel beams. By knocking out one sidewall, it will be possible to add another unit and double the capacity if the future should demand it. The design of the stoker is described and because of the multiple, closely spaced, air inlets, no auxiliary fuel is necessary. Double furnace walls of silicon-carbide brick extend 4 ft above the stoker. An American Blower fan, with a capacity of 34,000 cfm at 5 in. pressure, supplies the air for combustion and instrumentation is kept very simple. The operation of the plant, which at present employs only one shift, is described. Operating cost is $2.50 per ton. If future needs warrant, two or three shifts can be used and a second furnace can easily be installed.

65-0343

Halfgott, T., and P. Webber. Atomized suspension technique incinerates sewage sludge. Water Works and Wastes Engineering, 2(9):70-79, Sept. 1965.

The Thermosonic Reactor System (formerly the Atomized Suspension Technique) is an incineration process for the oxidation of sewage sludge to innocuous ash. After the sludge is filtered, thickened, and ground, it enters the top of the reactor as a mist and fine particle spray. The sludge is atomized and preheated, dried and evaporated, superheated, and finally combustion occurs. The hot gases of combustion flow up the annulus of the reactor to help heat the incoming spray by radiation through the annulus wall. The high velocity of these gases carry out the dust particles to a dust separator. Dried organic compounds in the sludge are used as a fuel supplement. The system is operated at a low pressure, and there is no odor to the operation. The percent of solids concentration in the sludge greatly affects the performance of the system. The viscosity of the sludge affects the velocity of the system. The thickener used in the system is a simple, moving fabric screen that allows a flocculated sludge to drain off water. Mathematical considerations of effects which act upon the system are given in this paper. Full scale operating data should be available from the organization using the system.

65-0344

The hazards of burning plastics. Public Cleansing, 55(4):219-220, Apr. 1965.

The hazards of burning some plastics, particularly chlorinated plastics such as polyvinyl chloride (PVC) are discussed. Chlorinated plastics give off hydrogen chloride and carbon monoxide when burned, both of which are poisonous, the former being a pungent irritant, the latter odorless, and both requiring special equipment to eliminate them from incinerator exhaust. Chlorinated plastics may be detected by the green color imparted to a flame of a previously heated copper wire when reheated with a trace of the plastic. (Text-German)

65-0345

Incinerator fly ash meter under development. American City 80(4):21, Apr. 1965.

A monitoring device to measure particulate matter in incinerator stack gases is under development by the Illinois Institute of Technology Research Institute, financed by a grant from the American Public Works Association Research Foundation.

65-0346

Incinerator plant's closed circuit TV cuts labor costs. Air Engineering, 7(7):20, July 1965.

A municipal incinerator at Oyster Bay has four closed circuit television cameras and remote controls, which assist the operating engineer by providing over-all plant coordination and control.

65-0347

Incinerators to cost Milwaukee $10 million. Refuse Removal Journal, 8(3):26, Mar. 1965.

Black & Veatch, a Kansas City, Missouri, consulting firm, has recommended the construction of two $5 million incinerators to handle all refuse for the city of Milwaukee. If the 11th largest municipality in the United States accepts the findings, it would have to purchase land from the Federal Government. This report ruled out the 1960 recommendation of one central incinerator and sanitary landfill as an alternative to incinerators, as no disposal sites within convenient trucking distance could be found. The new incinerators would combine garbage and non-combustible material to be collected and placed into the ovens together. The two incinerators would have three units each and be capable of disposing 1,800 tons of refuse daily. This capacity could take care of a predicted population of 1,021,000 by 1985.

65-0348

Irving, C. E. Flash drying and incineration. Water Works and Wastes Engineering, 2(9):70-72, Sept. 1965.

The sludge drying facilities at Schenectady, New York, have been in operation since January, 1954. Equipment consists of three vacuum filters, chemical equipment, and a flash dryer equipped for drying, bagging the product, incineration, deodorization, and dust collection. The sludge, which comes from a population of 80,000, is digested, vacuum-dewatered, dried in a Raymond Flash Dryer, and the resulting sludge is bagged. The dried product, named 'Orgro' is sold for $1.00 per bag. The filter cake is discharged to the mixer where it is mixed with previously dried sludge to reduce moisture content. The cage mill does most of the drying by intermingling the hot furnace gases with the conditioned sludge. A cyclone separates the solid particles from the gases. Incineration of sludge is necessary during the winter so as not to overload the digestors. The operating force consists of one man each for the filter, drying, and bagging operation. Charts give operating data and sludge drier performance data for the period 1959 to 1964. This data shows that the sludge drying process has performed well, is reasonable in cost, and is an important part of a public relations program.

65-0349

Lieberg, O. S. Heat recovery from incinerators. Part 1. General considerations, refuse handling, furnace , waste heat recovery, fly ash control, the heat balance. Air Conditioning, Heating and Ventilating, 62(6):53-57, June 1965.

The present day design objectives for waste heat incinerators include: a plant from which the maximum benefit can be obtained from the heat generated; to justify the cost of special equipment to utilize the heat; and to burn the refuse efficiently, economically, and reduce it to a satisfactory residue. A section drawing is given of the 750 ton per day incinerator for the town of Hempstead, New York. Also given is a table which shows the hourly heat balance of an incinerator having 20,000 lb per hr charge of refuse with a heating value of 4230 Btu per lb. The incinerator plant can be divided into three sections: the handling of the refuse at the site, discharge to storage bins, conveying from storage bins to furnace, and the residue removal; drying of wet waste prior to burning, provision for burning the refuse, draft control, auxiliary firing, stacks, etc., and fly ash arrestors, cyclone separators, settling chambers or scrubbers. Incinerators for years have had poor public relations and are considered by the public to be associated with smoke, sparks, offensive odors, and being a general nuisance. However, the control of air and water pollution which are possible with careful planning, control, and cooperation with public agencies should eliminate the concern over public health and nuisance problems. Despite the nearly 100 percent efficiency of electrostatic precipitators, the control of air pollution is best realized by thorough burning of refuse which decreases the load on the fly ash equipment. Only recently has waste heat from incinerators been economically applied.

65-0350

Lieberg, O. S. Heat recovery from incinerators. Part 2. Generation of service hot water and low, medium and high temperature water for space and process heating. Air Conditioning, Heating and Ventilating, 62(7):73-74, July 1965.

Heat recovery from incinerators for use in hot water generation is discussed. Hot water is required for many purposes in factories and municipal buildings. In planning factories, the incinerator building should be located adjacent to buildings where hot water is required. For process work, where the demand is sufficiently large, storage tanks can be located within the factory near the heat-consuming plant. A temperature range between 125 and 200 F can be easily controlled and a mean temperature maintained, depending on the requirements. An incinerator capacity of 500 tons of refuse day day will give an output of heat energy high enough to be gainfully employed, either for steam raising for turbo-generators or for heating of buildings within piping distance. High or medium temperature water systems with their high heat 'thermal fly-wheel' reserve in the pipelines are both economical and practical. Several incinerator systems which generate steam at 200 psig and temperatures up to 400 F are mentioned. The Oceanside, Long Island, incineration plant, which is probably the first to use waste heat energy to provide both electric power generation and salt-to-fresh water conversion, is described. Steam, which drives a 1,250-kw turbine generator, is produced in two C.E. forced circulation boilers each with a rated capacity of 85,000 lb steam per hr at 462 F and 460 psig. A schematic representation of a heat recovery, distribution, and utilization system for an incinerator plant is presented.

65-0351

Michaels, A., C. A. Rogus, R. Novick, et al. Incineration (Panel). In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.K-1 to K-42.

The main purpose of incineration is to get rid of something. Various design considerations are listed. The characteristics of the refuse must be known. The major chemical characteristic of refuse which determines the size of the units which form the incinerator plant is its Btu value, which may vary from 3,500 to 5,500 Btu per lb. Grate loading requirements, air requirements, the refractory problem, residue handling systems, instrumentation, shift operation, ventilation, and economics of operation are discussed. The public health aspect is becoming increasingly important. Research and testing in the field is outlined. An important consideration in the design of the plant is the production of an effluent acceptable from a health standpoint. The effects of air pollution may be of an economic, nuisance or health hazardous nature. Estimated economic losses range from $60 to $200 per person. Temporary effects include eye irritation. Long term exposure to air pollution has been ssociated with such chronic respiratory diseases as asthma, bronchitis, emphysema, and lung cancer. Increasing attention has been given to the design and operation of incinerators. Incineration must achieve both maximum combustion efficiency to reduce atmospheric discharge of smoke, tars, malodorous compounds, and other products of incomplete combustion; and maximum retention of the incombustible solids. The whole process of incineration tries to achieve volume reduction, the residue ranging from 5 to 15 percent. The salvage or reuse of residue is discussed. Questions directed to the panel concerned: quenching water, a rotary kiln type of incinerator, disposal of sewage sludges and grass.

65-0352

Milton, H. E. Incinerator cuts air pollution with new engineering devices. Refuse Removal Journal, 8(6):22-23, 36, June 1965.

Stratford, Connecticut, has a new incinerator with the latest design and equipment for high combustion efficiency and air pollution control. The incinerator is the pit and crane type and has two 120-ton per day continuous feed furnaces with a traveling grate. Municipal collection of refuse is also described.

65-0353

Milwaukee must rush incinerators. Refuse Removal Journal, 8(4):11, Apr. 1965.

Milwaukee has been looking for refuse dump sites for the past 4 years without success. William H. Rheinfrank, superintendent of street sanitation said that the city's present grounds could be used for another 2 years. He urged that prompt action be taken on the proposal for two new incinerators because they take several years to build. Black & Veatch, Kansas City, Missouri, consultants, recommended that the city convert its present refuse collection and disposal system, using two incinerators capable of burning all waste. The incineration was necessary because Milwaukee was running out of dump sites for non-combustibles. The Finance Committee of the Common Council has required the submission of a detailed report outlining the procedures necessary to put the Black & Veatch recommendations into effect, which would include cost data, information on traffic patterns near the proposed incinerators, and the possibility of building one central unit. The incinerators will cost an estimated $10 million.

65-0354
Montens, A. Incineration of waste oil and oil sludges. Wasser und Abwasser, 106(14):382-383, Apr. 9, 1965.

The problems inherent in incineration are basically the varying water content and the impurities present in the waste oil and oil sludges. The equipment used is discussed. Filters must be used before the sludges reach the incinerator, but the impurities may quickly clog the filters. Low-viscosity waste oils and oil-water mixtures are sprayed into the flame chamber. Tar residues with a semi-liquid or dough-like consistency are burned in a revolving tube furnace; the tar is mixed with sawdust so that it can be more easily deposited in the furnace. Solid waste can also be burned in a revolving tube furnace, which is described and illustrated. Muffle furnaces are suited for oil sludge incineration but they are arranged horizontally so that the ash is not discharged automatically from the furnace, which fact is considered a great disadvantage when this furnace is compared with the revolving tube furnace. The turbulent layer furnace is also used for the incineration of oil and sludges although it cannot be used when solid wastes are present. (Text-German)

65-0355
Moore, W. M. Teepee refuse burner has extension dome. American City, 80(8):165, Aug. 1965.

A tepee refuse burner for the incineration of bulky wastes was put into operation in January 1965 in Lexington, Kentucky. The Wilco 45 tepee refuse burner has the following special features: (1) an extension, 20 ft tall with a diameter of 16 ft 3 in., placed atop the regular tepee model 45. Covered with 16 gauge hot-rolled Armco steel, the extension lifts the dome to an overall height of about 70 ft. This permits more thorough burning before the smoke escapes. (2) A special concrete base for the burner, to support it on the unstable landfill terrain. Supporting this base is a 9 in. thick, reinforced concrete, continuous core 'doughnut' with a 46 ft outside diameter and a 40 ft 'doughnut' hole. A 45 ft disk of reinforced concrete was centered atop this footing, completing the floor of the tepee. This slab was made 9 in. thick around the rim, and from 14 in. to 30 in. thick through its middle, with the thickest portion at the center. Forced air feeds in from underneath the floor slab through 7 in. diameter pipes. Two iron grates, each 18 by 9 by 1 in., were used to make the 19 in. square sets. These sets of grates were centered on a radius of 7 ft 7/8 in. in the concrete base, and are 9 ft apart on center line. Total cost of installation was about $15,500.

65-0356
National Research Council. Building Research Advisory Board. Apartment House Incinerators (Flue-Fed) Publication No. 1280. Washington, National Academy of Sciences, 1965. 37 p.

The flue-fed incinerator can function satisfactorily if it reduces the refuse to as small a weight and volume as practicable without discharging objectionable gases and pollutants, acts as a temporary storage bin for refuse without attracting or harboring rodents or vermin, and remains simple to maintain and operate, with most operations automatically controlled. The three major air pollutants resulting from incinerator combustion are particulate matter, smoke, and odors. It is recommended that no incinerator be permitted to produce more than 0.85 lb of particulate matter per 1,000 lb of any flue gas corrected to 50 percent excess air. Design of new incinerator installations should be placed under the responsibility of an architect-engineer firm having knowledge and experience in combustion processes. For existing single-flue incinerators, primary effort to improve operation of the units should be directed towards the combustion chamber, through inclusion of adequate combustion equipment and controls, controlled charging firing, and automatic operations. For low-rise buildings use of a single-flue incinerator with by-pass gas flue is acceptable provided that automatic operation is utilized. Volume for single-chamber incinerators may be calculated on the basis of not less than 0.375 cu ft per person where the burning period is 10 hr or less. Controlled charging through the use of hopper door locks and/or main flue gates should be employed. A major coordinated program of research for incinerators and alternative methods of apartment refuse disposal is recommended.

65-0357

Palmer, C. L. Smokeless brush disposal. Public Works, 96(51):90, May 1965.

Two smokeless brush burning plants of the department of Public Works, Detroit, Michigan, consume all tree trimmings, brush and logs collected by city departments, and on a trial basis, similar wastes from private nurseries and landscapers. Before the construction of the smokeless burning plants, the city disposed of logs and brush by open burning, which created local safety and air pollution problems. An incinerator designed especially for brush burning was developed. Built into the incinerator are two burning chambers, three wash chambers, a settling chamber and a breeching (in that order). Two men are required to operate each plant; one man operates the front end loader, the other directs traffic in and out of the area, overseas the dumping of loads and adjusts the forced air and wash chamber water. Details are given as to the structure and operation of the incinerator; a diagram is included.

65-0358

Pneumatic conveyor speeds fly ash removal. Public Works, 96(4):115, Apr. 1965.

A pneumatic ash conveyor system was placed in operation at the municipal incinerator serving Winnipeg, Manitoba, obviating the slow, laborious removal of fly ash from settling pits. The incinerator plant consists of four manually stoked 100-ton Nichols Monohearth furnaces of circular design and a newer, 200-ton capacity furnace equipped with Flynn and Emrich rocking grates with hydraulic controls. Fly ash is removed once a week from settling pits in the expansion chambers leading to the chimney. A hose with intake nozzle is attached to a pipe in the Fuller Airveyor/Airstream conveying system. The system picks up the ash and conveys it to a receiver-filter outside the plant building. Material collected in the receiver's hopper is dropped into a waiting truck and hauled away. Dust is trapped by cotton cloth bags in the collector portion of the receiving station, so no particles leave the system to enter the surrounding plant atmosphere. By comparison with former methods, the pneumatic conveying system has greatly reduced the manhours required for this weekly cleaning task. However, the real saving is in furnace burning time. By doing the job more quickly the five furnaces can be put into operation 2 hours sooner than by the previous method of cleaning. At the rate of 25 tons per hr, this enables the plant to handle 50 tons more refuse per week.

65-0359

Ouillen, D. Low cost refuse burner eliminates dump. Public Works, 96(3):96-97, Mar. 1965.

Dodge City, Kansas, uses 'Burn-O-Matic' refuse burner, of conical shaped steel having a forced draft system. Centrifugal blowers supply underfire air through underground piping. The dome is screened to allow combustion gases to escape and to retain burned particles such as paper ash. Total height to the top of the dome is 57 ft 6 in. The rated capacity of the burner is 7,500 lb per hr. The present refuse disposal requirement is to handle 140 tons per week. Refuse is discharged on the floor of the receiving building from which it is pushed onto the conveyor belt by a front-end loader. The burner is operated from 9 am to 4 pm, being started merely by firing some dry material within the enclosure. The entire cost was $52,000.

65-0360

Refuse disposal and open burning. In A compilation of air pollutant emission factors for combustion processes, gasoline evaporation, and selected industrial processes. Cincinnati, U.S. Public Health Service, May 1965. p.31-35.

The source emission factors were compiled primarily for use in conducting an air pollutant emission inventory. The compilation is the result of an extensive literature survey. A brief description and the emission factors for the common types of municipal, industrial, commercial apartment, and domestic incinerators are given. Open burning, whether in dumps or in very simple backyard contrivances, gives rise to emissions that are extremely variable and difficult to measure. The data for backyard burning were derived from tests on burning mixture of 50 percent newspapers and 50 percent grass clippings. Factors for burning dumps and for backyard burning are listed. The emission of particulates from the uncontrolled burning of automobile bodies would be about 10 lb of particulates per automobile burned.

65-0361

Refuse furnace to desalt water. Engineering News Record, 175(8):23-27, Aug. 19, 1965.

A system in which refuse is used as fuel for desalting ocean water in the $6-million Oceanside Refuse Disposal Plant, is described and illustrated. Hot gases from the furnaces generate steam in boilers. The steam is first used in the turbine generators, then circulated through a closed system (four single-stage submerged-tube evaporators) where it is cooled with salt water pumped from a nearby salt-water inlet channel. The heat transferred in the evaporators boils the salt water to steam. Steam is drawn off and condensed to fresh water and the concentrated brine is pumped back to the inlet channel. Fresh water is stored in a 500,000 gal underground storage tank for use in the plant as boiler make-up, cooling, and flyash removal sprays. It is not used for drinking purposes. The air pollution control used in this system is briefly described. It is estimated that a high-efficiency combined refuse-disposal-desalting plant, with a capacity to burn 1,000 tons of refuse each 24 hr, could produce between 12 million and 14 million gal of fresh water a day at a cost of $0.45 per 1,000 gal of water.

65-0362

Rehm, F. R. Test methods for determining emission characteristics of incinerators. Informative Report No. 2. Journal of the Air Pollution Control Association, 15(3):127-135, Mar. 1965.

Standardized test methods for determining air pollution characteristics are important because any standardized emission limitations would be worthless without standard test methods. This report of the Air Pollution Control Association's TA-3 Incinerator Committee represents the 'best thinking' of the Association on incinerator emission testing. The report is limited to the discharges of greatest immediate concern: visual emissions (smoke), particulates, and odor. Although the Ringelmann chart leaves much to be desired in efforts to assess the visual or smoke emissions, it is basic in the field of air pollution control and, until a better tool evolves, it will be the most frequently used method of assessing visual smoke emissions from incinerators and all other combustion processes. In the domestic gas incinerator field the Batelle CO method appears to have merit. It is based on a demonstration that the CO content is a valid indicator of the odor intensity with gas incinerators using a standard waste. For other incinerators, the ASTM Standard D1391-57 may be acceptable. The method is based on the dilution with odor-free air until the odor can just be perceived. For particulate determination, there has been much research, but it is believed that the ASME Test Code PTC 21-1941 and PTC 27-1957, with modifications and additions, could be the basis of a standardized test method for determining incinerator particulate emission characteristics in spite of the differences with WP-50 Bulletin of the Western Precipitation Corporation. This article reports the progress toward standardized test methods rather than the methods.

65-0363

Rogus, C. A. Incineration. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.J-3 to J-12.

The disposal of municipal solid wastes in the large community has favored incineration due to the difficulty of obtaining adequate and suitable land for sanitary landfills, the increasing per capita output of refuse, and the increasing calorific value of refuse. Mechanization and automation have stimulated modern incineration. Central incinerators burn refuse at high temperatures and reduce the combustibles to an inert, organic-free residue which can be disposed of by landfilling. Incinerators may be of the 'batch' type which operate with intermittent charging of refuse and discharge of residue, thereby creating non-uniformity in burning temperatures. This stirs up fine dust and subjects the refractories to shock temperatures, and for these reasons the batch type furnace is going into disfavor. The 'continuous' type furnace and incinerator overcome these shortcomings and are more economical to operate. The major components of the modern plant, which are described, are: tipping floors, storage pit, cranes, furnaces, residue system, combustion chambers, subsidence chambers, and chimneys. Incineration is prompt, health hazards, and odors are destroyed or alleviated and costly collections are dispensed with. The major disadvantages of incineration are: the higher costs of construction, generally higher costs of operation and maintenance, the greater skills required for efficient, nuisance-free operation, and the need for final disposal of the residue by landfilling. The historical background, basic design considerations, and construction and operating costs of incinerators are discussed. In determining the design capacity of an incinerator, seven major items must be considered: the plant's objective, type of refuse to be processed, amortized life, number of plants, daily and seasonal variations in refuse output, operating shifts, and plant operating factor.

65-0364

Sager, J. C. Scum disposal by incineration at the Minneapolis-Saint Paul Sanitary District. Journal of the Water Pollution Control Federation, 37(9):1243-1246, Sept. 1965.

The development of the Minneapolis-St. Paul scum incineration system from a pilot sewage treatment plant which is the first of its type in the United States is described. A line sketch of the system shows the troughs into which the scum from the primary tanks is skimmed by hand, the disintegrator in which twigs and corks are broken up, the decanting tanks and the feeder tank which leads to the incinerator. The sketch includes the design of the incinerator, which has no moving feed equipment or grates. The decanted scum is pumped into the top of the primary chamber and falls onto a slightly sloping brick hearth and onto downstepped cast iron tuyers, with most of the active burning taking place in the primary chamber. The gases go over a baffle wall into a secondary chamber and then through a latticed or perforated brick wall into a short chamber before going to the breeching and stack. The four oil burners are located in both the primary and the secondary combustion chambers and are automatically controlled. The burners use No. 2 oil and cut out at 1,600 F. The quantity of ash removed daily amounts to a few pails. The system has worked well with little maintenance and no smoke or odors. During 1963, 1,612 tons of decanted scum were incinerated in 274 days. The scum had an average of 9,280 Btu per lb with 62.8 percent solids. The average amount of scum incinerated per day was 5.9 tons, with 14.5 gal of No. 2 oil per ton of scum. Previous problems with disposal of sewage scum have been eliminated.

65-0365

Sewage sludge incineration. Chemie-Ingenieur-Technik, 37(5):556, May 1965.

A high-temperature, low-pressure method has been developed by the Pulp and Paper Institute of Canada for the incineration of sewage sludge. The sludge is partly dehydrated and pumped into the reactor, which is made of stainless steel and insulated with firebricks. At the upper end the sludge is atomized with the aid of a nozzle; at the bottom hot air enters at high speed. The pressure in the reactor is very low (approx. 76 cm water column) so that the water vaporizes. The rapidly dried particles are either gasified or burnt. The waste gases pass through a heat exchanger to regain part of the outgoing heat to preheat the reactor air. The waste gases are freed from the dust in a centrifugal separator and escape through a chimney. To prevent odors the temperatures in the reactor must be constantly kept between 760 and 1,100 C. (Text-German)

65-0366

Smokeless brush burning plants reduce air pollution in Detroit. Refuse Removal Journal, 8(3):8-9, 30, Mar. 1965.

Two smokeless brush burning plants in Detroit have eliminated open burning. The Department of Parks and Recreation is the major user of the plants which burn tree trimmings, brushes, and logs. Each plant features a 44-ft-long furnace. Smoke, fly ash, and other particles are trapped by a series of wash chambers. The plants are well under Detroit's minimum pollution control requirements.

65-0367

Speer, R. D. A crematory for animal disposal. American City, 80(8):121-122, Aug. 1965.

A special small animal crematory is incorporated into the new Hartsfield incinerator in Atlanta, Georgia. The crematory has a total capacity of 1,000 lb per hr after the furnace reaches burning temperature. Trucks dump directly onto the two charging chutes on the floor directly above the furnace. The natural-gas fuel contains 1,040 Btu per cu ft, and its specific gravity is 0.6. Five burners, of the blast type, with electric ignition and starters equipped with automatic flame-failure controls, operate this foolproof system. The three burners in the primary (loading) chamber area have a total capacity of 5 m Btu per hr. In the secondary chamber two burners with a capacity of 3 m Btu per hr burn all gases, thus eliminating odors completely. The insulation-lined breeching between the furnace and stack is brick. A guillotine-type damper at the beginning of the breeching and a flue-gas scrubber, for fly-ash removal, located at the end near the stack intake, complete the furnace layout. The animals are consumed completely and only calcified bone ashes remain which are used to fertilize the incinerator grounds. Refrigeration of the animal corpses allows the burning to be concentrated into 2 days per week. This has added to the economy of the system.

65-0368

Sterling, M. Brush and trunk burning plant in the City of Detroit. Journal of the Air Pollution Control Association, 15(12):580-582, Dec. 1965.

Air pollution laws have been difficult to enforce in Detroit because of burning of Dutch Elm-diseased trees, brush, and trunks. Strict compliance with ordinance requirements prohibiting open burning by house wreckers, scrap reclaimers, and landscapers was difficult. A sketch is given of a brush burning incinerator showing the charging door for brush at one end and the log charging door at the other end. The combustion gases pass a water spray system before discharge from the 6-ft diameter, 150-ft high stack. The results of stack sampling tests are given in a table which shows the gaseous and particulate emissions from the incinerator. An average of 1,000 cu yd of brush and trunks are charged in an 8 hr shift. The primary chamber for brush is equipped with a 12 by 10-ft horizontal sliding, motor operated charging door operated by radio control from the cab of a front-end loader. This allows the operator to charge the brush without leaving the vehicle cab. The secondary or log-burning chamber is similarly equipped. The reduced Detroit particulate emission limitations of 0.09 grains per cu ft at 500 F at 50 percent excess air are well above the emission determined. The ash, amounting to 5 cu yd a week and representing a 99.9 percent volume reduction is removed after the unit cools over the weekend. Because of the success of this plant, another one is being constructed to take care of all brush and trunk wastes. With extra underfire air admitted toward the rear of the primary brush chamber, a wider variety of wastes, such as Christmas tree, can be handled. The city of Detroit now complies with its own air pollution ordinances, and the burning plant should interest other cities.

65-0369

Stirrup, F. L. Pulverization and grinding. In Public Cleansing; refuse disposal. Oxford, The Institute of Public Cleansing, 1965. p.59-71.

Pulverization is used to reduce volume. Refuse is fed in the top of the pulverizer, struck by rotating hammers and shredded. It must be sufficiently small to pass through screen bars. Preseparation of materials likely to cause damage is essential. Metal objects are discharged into a separate chute and subsequently sold as clean metal. Material is separated into dust, pulverized refuse, and rejects. When tipped, the pulverized material is not attractive to vermins as it is an almost odorless paste-like material. It heats readily to 165 F commencing to compost almost at once. It can now be shown costs can be reduced and handling capacity increased. When grinding food at the source, the grinder is below the sink and attached to an outlet. Cold water flushes residue out of the grinder and into the sewer. Its value is in health and hygiene. Several cities in the United States have large central grinding depots to deal with separately collected garbage too wet to incinerate.

65-0370

TV to monitor incinerator operation. American City, 80(1):34, Jan. 1965.

In Oyster Bay, New York, four television cameras will assist the operation of an incinerator. The plant, scheduled to start operating in the fall of 1965, will have two cameras on the charging floor to survey the entire bin area. Each of the two furnaces also contains a camera focused on the burning grate. Two monitors are located on a control console in the operating engineer's control room, where the operating engineer can view either the furnaces or the bin. This closed-circuit television system eliminates the need for constant supervision of additional men, and results in closer control over the burning capability of the plant. On the furnace monitors, the operating engineer can detect whether it is necessary to increase or decrease grate speed to achieve optimum operating conditions. The controls for varying the amount of overfire and underfire air water spray, for example, are mounted near the monitors, 1,200 units of industrial television are utilized across the country in similar utility plants.

65-0371

Wangerin, D. D. Waste-heat boilers...principles and applications. Combustion, 37(3):24-31, Sept. 1965.

In spite of the inducements to use 'free' fuel such as is provided by bark and wood refuse, black liquor, municipal and industrial wastes, and sludges, wastes are extremely poor fuels compared to the usual prime fuels. A table shows that the prime fuels are three to four times more effective than waste fuels. Another table shows that the waste fuels have high moisture and often high ash content. The problems encountered by the boiler designer in developing special equipment to utilize the meager heat content of these fuels are described. The discussion is limited to the utilization of the principal waste products available in the pulp and paper, steel, and petroleum industries. The designer must tailor his unit to meet the worst possible conditions with the major attention directed toward fuel-burning equipment with adequate combustion air to obtain maximum efficiency and minimum carryover. Large furnaces to complete combustion and absorb sufficient heat before the gases enter the convection area, and low gas velocities and widely-spaced convection surfaces to prevent plugging and erosion are necessary. Line drawings are given of a 1,000-ton black liquor recovery unit, and three drawings of bark boilers, including provision for auxiliary coal of natural gas. Six illustrations covering the combustion of waste gas from the steel industry are included. There are many waste products from which heat energy can be recovered, but each has characteristics that require a boiler of special design. Multiple-fuel-fired boilers can dispose of waste products while minimizing the cost of prime fuels.

65-0372
Weller, L. W. Pipeline transport and incineration. Water Works and Waste Engineering, 2(9):66-69, Sept. 1965.

In Kansas City, Missouri, economic and location factors favor the use of a single sludge processing plant where raw sewage sludge will be pumped a distance of 35,000 ft between plants. The 12-in. diameter pipe has no bends greater than 22½ degrees and the 1 percent maximum solids concentration liquid will flow at the rate of 1,000 gpm. Two pumps in parallel with a force main 'C' value of 100 will operate continuously. Facilities for cleaning the sludge pump piping include a cleaning tool of 'pig' which would be lowered into the pump discharge line and forced through the valves into the line. Also steam injection methods have been provided for cleaning. Removal of the 'pig' is relatively simple, effected by moving it through by-pass valves so that the flow is not hindered. Chlorine can be injected into the pipeline to control slime growth and odor by means of a chlorinator equipped with a flow recorder and integrator. The pipeline is easily accessible by a series of manholes. The sludge will be discharged from the force main into a thickener; it then goes to a continuous belt cloth type vacuum filter for dewatering processes. Finally the filter cake produced is ignited.

65-0373
Winkler, T. E. Incinerator serves suburban communities. Public Works, 96(12):74-77, Dec. 1965.

The incinerator for Central Wayne County, located in Dearborn Heights, Michigan, began operation in 1964. It provides for minimum hauling costs for five surrounding communities. Having an ultimate capacity of 750 tons per 24 hrs, the plant is of the crane and bin type with continuous feed, reciprocating grate stokers. Two furnaces are now installed, each with 250 ton capacity. Ashes are quenched and discharged into a truck for removal to a landfill. Total cost of the incinerator, including land and engineering was $2,368,000. Operating costs are estimated at $4.50 to $4.75 a ton of refuse processed.

INCINERATION–Europe

65-0374
Bradford's new refuse disposal plant. Surveyor and Municipal Engineer, 125(3793):39-40, Feb. 13, 1965.

The new incineration and separation plant built at the cost of £430,000 which was made necessary because of a shortage of tipping space is described. This new incinerator created more than usual interest because the tipping operation at Bradford was well-known and attracted many visitors and men for training for fifty years. A picture showing a general view of the plant also shows the 180-ft chimney. The other pictures show the hydraulically-operated carcass and trade waste charging doors on the tipping floor, a general view of the salvage room showing the sorting belt and the overband magnetic separator, and the top charging floor of the incinerator with a reversible shuttle conveyor which feeds the tailings to the charging door. Large areas of glass give natural light and good working conditions with special attention being given to internal finishes to ease cleaning and maintenance chores. After weighing, the trucks enter the reception hall and deposit their loads into 100 cu yd hoppers, the base of which is a slow conveyor. The conveyor feeds to the primary revolving screen to remove most of the dust before the picking conveyor, which feeds to the designer in developing special equipment to utilize the meager heat content of these fuels are described. The discussion is limited to the utilization of the principal waste products available in the pulp and paper, steel, and petroleum industries. The designer must tailor his unit to meet the worst possible conditions with the major attention directed toward fuel-burning equipment with adequate combustion air to obtain maximum efficiency and minimum carryover. Large furnaces to complete combustion and absorb sufficient heat before the gases enter the convection area, and low gas velocities and widely-spaced convection surfaces to prevent plugging and erosion are necessary. Line drawings are given of a 1,000-ton black liquor recovery unit, and three drawings of bark boilers, including provision for auxiliary coal of natural gas. Six illustrations covering the combustion of waste gas from the steel industry are included. There are many waste products from which heat energy can be recovered, but each has characteristics that require a boiler of special design. Multiple-fuel-fired boilers can dispose of waste products while minimizing the cost of prime fuels.

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65-0374

Built for growth. Public Cleansing, 55(2):81-84, Feb. 1965.

Kidderminster, England, with present population of 43,000, has opened a separation and incineration plant, which can later be expanded with two extra incinerator cells to serve 70,000 people. Landfill space for the next 5 years would have cost $200,000. A brief description of the operation from conveyor belt sorting to incineration in the 4 semi-mechanical, trough grate units is included.

65-0376

Continuous grate for the new Birmingham plant. Public Cleansing, 55(10):588-589, Oct. 1965.

Birmingham, England, is to be served with a continuous grate incinerator, which will operate in sections, with mechanical fingers moving the refuse along the grate, and each section having separate controls and air supply. Because of expense, pulverization wasn't to be used unless necessary. Large items would be incinerated separately. Tin cans were to be incinerated and not recovered.

65-0377

Exhibit for hospital equipment in Dortmund between May 19 and 22, 1965. Staedtehygiene, 16(5):125, May 1965.

At the exhibit for hospital equipment the company Ruppmann, Stuttgart, West Germany, showed 3 types of waste incineration for hospitals; one with a capacity of approximately 0.2 cu m per hr, one with approximately 0.75 cu m per hr, and one for 0.5 cu m per hr. The latter one can be used for incineration of standard hospital waste as well as for moist trash from the operating room. It has a furnace substructure for dustfree waste removal. The furnaces permit a sanitary incineration of plaster castings, kitchen wastes, disposable bed sheets, animal carcasses, tissues, etc. Prior to loading, the furnaces are heated up to the operating temperature by an oil or gas burner. To avoid odors the waste gases are led through an afterburner. (Text-German)

65-0378

Fairlie, P. D. Correspondence. Public Cleansing, 55(3):175-176, Mar. 1965.

Several aspects of mechanical vs. static grates and power utilization in incinerators are discussed. Mechanical grates were felt to provide higher burning rates, but all factors had to be considered. Some British cities requested bids for both static and mechanical wastes in their proposed incinerators. Heat utilization for power and steam was felt to be economically impractical, because of the somewhat undependable nature of the fuel and fuel supply, which would necessitate an expensive reserve power plant.

65-0379

Fairlie, P. D. Incineration plants without heat recuperation. Public Cleansing, 55(6):356-377, June 1965.

Arguments for incineration of refuse without recuperation of heat for steam or electric power, and the general types and operation of incinerators and associated equipment are discussed. The 640 ton per day Govan, Scotland incineration works were designed in 1928 for electric power production, and produced 40 million kwh in 1936 with a revenue of $90,000 but only 8½ million kwh in 1945 with a revenue of $18,000. The Govan works are now reconverted to incinerate without heat utilization. Special emphasis is placed on experience and operation of all phases of the Scottish works at Govan and Polmadie, and diagrams and thorough explanation of these 800 ton per day, two-shift plants are included. The rate of burning on mechanical and static grates is discussed. Various methods of charging and clinkering the cells are explained. Dust collecting equipment is reviewed regarding standards, efficiency, and cost. Working data and examples of dry mechanical, electrostatic precipitators, and wet dust collectors are shown. Separate incineration of bulky and trade refuse with utilization of heat for plant use is handled. The design and operation of the salvage section is explained with criteria for selection of conveyors, and types of atmospheric dust cleaners for the plant. The overall cost of disposal at these two works is about $3 per ton including $1 per ton load charges based on a 30 year life.

65-0380

Flue, dust extraction systems. Public Cleansing, 55(7):434, July 1965.

Comments on Schieble and Multi-vortex flue dust extraction systems, both of which are operated in Glasgow incinerators are given. The Multi-vortex plant used with a water trough at the chimney base collected 30 lb per ton burned which the Schieble plant collected 36 lb per ton but needed a heat exchange to avoid white chimney smoke.

65-0381

Gross, A. T. Common incineration of sewage sludge and trash. Brennstoff-Waerme-Kraft, 17(11):562-564, Nov. 1965.

The common incineration of sewage sludge and waste was the main theme of discussion at the annual meeting of the association for waste water technology held in Frankfurt from September 28 to October 2, 1965. The highlights of the discussion are reported. Sewage sludge from settling tanks can be reduced to 1/4 of its volume through rotting. It is at the same time the most economical method for dehydrating the sludge. The sludge from biological plants can only be reduced to half of its volume. There are three possibilities for treating sludge and waste in common. The common dumping is of no great advantage mainly because of lack of disposal sites. A common composting, however, can be taken into consideration especially so because the completely sterile end product can be deposited everywhere, should there be no possibility of selling it. With the common incineration the sludge must be dried first to raise its heating value to that of the trash. The heat from the trash is usually sufficient for drying the sludge. From the various methods of incineration the Ebinger method must be mentioned. Here the trash is added to the drying sludge in a story furnace. Of disadvantage is the necessity to crush the waste first. When comparing the two methods, common incineration and composting, with each other to assess the advantage of one over the other, one must first answer the questions, how much residue remains, and what is the cost per ton of waste? The first question is answered in favor of common incineration. Almost half as much residues are left from incineration than from the combined process of composting and incinerating. Comparing costs, composting is favorable. If the sale of compost or slag is not considered, the price relation is 27 DM per ton for composting vs. 38 CM per n for incineration. (Text-German)

65-0382

Incineration of bulky materials. Public Cleansing, 55(7):399-403, July 1965.

The trend towards separate incinerators for large, bulky and hard to dispose of materials in Britain is explained. Most cities now have provisions for incinerating dumped household furniture, parking boxes, and other items regardless of regular disposal methods.

65-0383

Incinerator furnace capacity 2.84 cu. ft. Engineering, 199 (5164):473, Apr. 9, 1965.

Stated to provide a quick and hygienic means of disposing of waste, the Junior incinerator is made by Maywick Appliances Limited, of Wickford. The unit is obtainable for operation on solid fuel, propane, or town gas; heat input of both gas-fired models is 105,800 Btu per hr. In the case of the propane-fired model, the gas rate is 41.5 cu ft per hr; that of the unit using town gas is 210 cu ft per hr. Furnace capacity is 2.84 cu ft. The height of the unit, without the flue, is 2 ft 8 3/4 in.; the length of the flue pipe, which has an outside diameter of 8¼ in., is 8 ft 6 in. The incinerator measures 1 ft 6½ in. wide and has a depth of 1 ft 8¼ in. The loading door is 1 ft 6 in. by 1 ft. The weight is approximately 5 cwt. The incinerator is supplied ready for use; a galvanized chimney with cone cap, and a steel rake for ash removal are included. Among the optional equipment which is obtainable are: an after-burner, with flame failure device; a main burner flame failure device; a time clock controlling the main burner;

and a lighting torch. Where the matter to be disposed of is waste with a high water content, or animal matter with a low fat content, operation on coke is reported to be particularly economical. Tested on a poultry farm, it was found that the incinerator would consume 80 lb of diseased birds using only 5 lb of propane and a small bed of coke, for a total cost of 4s.

65-0384

Incinerator specifications. Waste Trade World, 106(5):8, Jan. 30, 1965.

The requirements for incinerators for waste are indicated in a description of the specifications of a recent standard published by the British Standards Institution. The latter is concerned with waste from trade and residential premises and capacities between 50 and 1,000 lb per hr. The rating of an incinerator (capacity in cu ft and burning rate in lb per hr) are related to the weight, nature, and bulk density of the refuse. The capacity and burning rate of an incinerator, therefore, should include the characteristics on which the rating is based. The grate construction should be of such size as to accommodate the specified burning rate. For materials with a high moisture content, an incinerator in the range covered by specification should be capable of being equipped with a hearth and ancillary burners. The volume of the burning chamber should be adequate to enable the refuse to be burned at the specified rate. The specifications cover furnace lining, surface temperature features, access doors, external finish of the outer casing, charging door size, ashpit design, agitator, provision of air for primary and secondary combustion, and supplementary heating for primary combustion. Consideration is given to safety factors, smoke emission, and flue size. Notes are given on suitable categories of waste and the Clean Air Act of 1965; installation and operation are given in the appendices. A list is given of types of wastes not within the scope of the specification, such as rubber, plastics, wood, scraps, paints, animal carcasses, remains, or sludges which require special installations designed for the specific purpose.

65-0385

Ingwersen, H. H. Experiences with a novel waste incinerator grate. Staedtehygiene, 16(10):223-228, Oct. 1965.

The roller grate, 'System Duesseldorf', was developed especially for waste incineration by the two boiler manufacturers Durrwerke AG, Ratingen, and Vereinigte Kesselwerke AG, Duesseldorf, in cooperation with the department of utilities of the city of Duesseldorf. Today, ten plants equipped with this grate are either planned or in operation. Their characteristics are summarized in a table. The grate consists of several rollers of 1.5 m diameter. Each roller is driven individually by gears and the speed can be varied from 0.4 to 8 revolutions per hr. Because of this low speed the waste burns uniformly and very little (1 to 6 g per cu m) dust develops. Temperatures between 900 C and 1000 C ensure a flue-gas free of odors. These limits are maintained by additional oil or gas burners, or respectively by high excess air supply. Experiences with the incinerator in Rosenheim, Bavaria, are reported in detail. Relevant data are summarized in a table. The incinerator uses 4.5 tons of waste per hr in continuous operation from Monday through Friday. It produces 7.5 tons per hr steam at 12 atmospheres which is fed into the municipal remote heating system. Overall-efficiency is 65 percent. The plant in Rosenheim cost 2.8 million DM which will not be recovered by the sale of heat. (Text-German)

65-0386

Kachulle, C. Waste incinerators with and without using the heat. Brennstoff-Waerme-Kraft, 17(8):391-395, Aug. 1965.

The third congress of the International Work Group for Waste Research (IAM) took place in Trento, Italy, from May 24 to 29, 1965; 650 scientists and experts from Europe, the United States and the Near East participated. The main theme was waste incineration with and without using the heat. Four papers presented are reviewed. H. Rousseau, France, described incinerators in and around Paris. He presented a detailed cost analysis for the incinerator Issy-les-Moulineaux, which cost 100 million francs and has a capacity of 68 tons of waste per hr. With using the heat for electric power, the plant can be written off in nine years. P. D. Fairlie, Glasgow, said that in Great Britain heat from waste costs about twice as much as from conventional fuel and that, therefore, waste incinerators usually do not utilize their heat. In Glasgow, waste with a grain size below 1¼ in. is not incinerated but used as mulch. The paper by C. Kachulle which describes the waste incinerator to be built near Cologne at Goldenbergwerk, is reviewed in detail. It will incinerate 1.3 million tons per year. The net deficit will be 10 to 17 DM per ton. Schematics of the over-all design and the Weyrauch-Babcock boiler are given. The plant will serve a population of 4.1 million, will cost 40 to 50 million DM, and will sell its heat to electric power plants. The paper by K. Schwarz emphasizes the advantage of large incinerators over small facilities, in particular with respect to air pollution problems. (Text-German)

65-0387

Kampschulte, J. Elimination of household and bulky waste as well as of special waste in Hamburg. Staedtehygiene, 16(10):218-223, Oct. 1965.

In the year 1964, Hamburg had an accumulation of waste of 2.5 million cu m, of which 1.08 million cu m could be burned while the remaining 1.42 million cu m had to be dumped. A new incinerator plant is presently under construction at the site of an already operating waste incinerator. In the new plant, wastes from freighters and passenger boats (mainly packing material), bulky waste from households and industries will be crused and burned. Oily sludge will be added to the waste for incineration. The new plant has been designed for a capacity of 12 tons per hr at a maximum gross heat capacity of 23 G cal per hr. The steam boiler has been designed for a maximum capacity of 27 tons of steam per hr. A layout of the incinerator plant together with the newly planned buildings is given. Cranes bring the waste to a loading funnel through which it falls onto the grate. The grate spans a surface of approximately 31 sq m. It is 4 m wide and has 15 poking stages. Nozzles distributed across the width of the grate spray the oily waste into the combustion chamber. The slag is treated for further utilization. The hot slag gases are led to an electro-filter from where they escape through the slag gas duct and the chimney (80 m high) into the air. The waste from the harbor is brought in barges on the canal to the incinerator plant. It is planned to use 3 and 5 cu m containers for the transport. A Hazemag crusher of small capacity, which has been set up experimentally several years ago, serves for crushing the bulky waste and the slag. A crane brings the waste from the barges to the crusher. If the waste is brought on trucks they tilt the load into a bucket (volume 15 cu m) which is lifted and emptied into the crusher. The crushed waste falls onto a conveyer belt bringing it to the storage room. A diagram and a photograph illustrate the Hazemag crusher. (Text-German)

65-0388

Knoll, H. The waste incinerator plant of the city of Nurnberg. Brennstoff-Waerme-Kraft, 17(12):595, Dec. 1965.

The waste incinerator plant in Nurnberg will go into operation in the fall of 1968. Two furnaces will burn 300 to a maximum of 360 tons of waste daily. A third furnace is available for standby operation. A fourth furnace can be added. The waste storage room has a capacity of 5,400 cu m. An extra flame chamber for burning waste oil will be installed. In the connected boilers steam of 84 atm. at 450 C will be produced. They are designed for 27 to 34 tons per hr. The steam goes to a remote heating station 300 m away. Apart from the incinerator plant a new autoclave method for processing sewage sludge is being developed. The activated sludge--about 2,000 cu m per week--is heated up to about 165 C by the hot sludge coming from the autoclaves. By adding steam the temperature of the activated sludge is further raised to 200 F. In the heat exchanger it cools down again to 65 C. Through this heating-up process the sludge is sterilized and the colloid binding of the water is broken. In a filter press the water contents can then be reduced to 40 percent. By subsequent air drying the water contents decreases to 15 to 20 percent. The sludge is ground and will be utilized for agricultural purposes. (Text-German)

65-0389

Measures taken in waste incineration plants to prevent air pollution. Public Cleansing, 55(9):532, Sept. 1965.

An abstract of a paper by Dr. Karl Schwartz, presented at the International Research Group on Refuse Disposal, held in 1965 at Trento, Italy is described. Smoke pollutants, size of incinerator, meteorological considerations, volatile dust and other factors are investigated with particular reference to German programs.

65-0390

Midland miscellany. Public Cleansing, 55(2):79-80, Feb. 1965.

Derby, England, has decided on incineration to solve its landfill area shortage problems. Because of industrial wastes, including much ash from local power stations, disposal sites are at a premium. A 210 ton per day total-incineration unit, fully automated with mechanical grates is projected. In Long Eaton, England, an increase in salvage demand was felt to be based on a temporary 15 percent import tariff and didn't justify increased salvage drives. The collection of refuse after public holidays in Sedgley, England, was expedited by distribution of paper bags to handle the additional refuse.

65-0391

New incinerators for greater London. Public Cleansing, 55(12):663-664, Dec. 1965.

The significance of the Greater London Council's decision to build two 1,000 ton per day power-generating incineration plants with total incineration cost including loan charges to be met substantially by power sales is explained. The proposed capital expenditure is $31 million dollars for the two plants.

65-0392

New refuse burner. Waste Trade World, 106(8):27, Feb. 20, 1965.

A new burner for general refuse with a charge capacity of 6 cu ft and a rating of 80 lb of general refuse per hr, suitable for use in schools, supermarkets, small hospitals, and otels, has been announced by A. B. Scorer Ltd. of Manchester. This latest development called the Scorer C63, complies with the Clean Air Act through the provision of a water trough dust settling chamber and gas-fired afterburner or ignition burners capable of being fitted to suit the type of refuse. The fire bars are designed to give maximum cooling. If required, flame failure controls, electric pushbutton ignition, and timer control can be furnished. The one-eighth-inch MS plate casing is lined with 3-in. pre-cast refractory slabs. All furnace castings are made with heat-resistant cast iron. The 3,000 lb incinerator is delivered to the site already assembled, although it can be supplied in sections where access is difficult.

65-0393

Perreten, R, T. R. Jeheber, and E. Guex. Loading wharf and treatment plant for urban wastes, Geneva. Bulletin Technique de la Suisse Romande, 91(15):229-242, July 1965.

Details are given for the design and construction of solid waste loading and unloading wharfs and the associated incinerator. The incineration plant, which began operation January, 1966, is located downstream from the loading wharf and provides an inlet canal leading to elevators for the barges. The elevated barges are unloaded by a series of grapples on a moving track which then dump the solid wastes into storage silos or into a feed hopper. This plant also receives solid waste directly from trucks. Sludge is discharged into basins. The loading wharf, situated upstream on the junction of the Rhone and Arve Rivers, provides for the dumping of solid wastes from trucks directly into barges in a canal below. Five trucks can be dumped simultaneously. The theory of construction and the construction materials for both wharfs and their adjacent working areas are discussed. (Text-French)

65-0394

Riedlinger, R. A. The waste incinerator plant in Dusseldorf, West Germany. Elektrizitaetswirtschaft, 64(24):682-684, Nov. 1965.

Since 1954 a departure from dumping waste has been contemplated in Dusseldorf. Composting of accumulating waste was discontinued because there is not enough agricultural area around Dusseldorf to provide a market for fertilizer. An experimental incinerator with roller grates was established to furnish data for construction of a large four-furnace plant, which will be completed by early 1966 and will operate continuously to eliminate the 220,000 to 230,000 tons of waste accumulating annually. Flue gas heat will be used to produce steam. The scrap will be removed from the ash, packaged, and sold. The ash will be separated into various grain sizes and sold too. Only glass-containing ash will be dumped. The plant is composed of storage building, incinerator building, ash-processing and scrap-packaging building, building for the personnel and offices, and an entrance building. There is room for 12 vehicles to empty their loads simultaneously. Each furnace will burn 10 tons of waste per hr between 900 and 1000 C and produce up to 16 tons of steam per hr. A layout, cross section, and illustrations of the plant are included. (Text-German)

65-0395
Roll waste incinerators for foreign countries. Schweizerische Bauzeitung, 83(46):856, Nov. 18, 1965.

The city of Nurnberg will receive a waste incinerator with three furnace-boiler units handling 300 tons of waste per day each. Steam for electric power will be generated. Shortly after Osaka, Japan, made operational its Von Roll incinerator, Nihon De Roll Y.K., a subsidary of Von Roll AG, received an order for an incinerator for the city of Kyoto. It will consist of two furnace-boiler units handling 200 tons per day each. The steam generated will be used for heating purposes. Both plants will meet stringent requirements of the air and water pollution control regulations. (Text-German)

65-0396
Smokeless incineration. Waste Trade World, 107(15):7, Oct. 9, 1965.

Designed mainly for the smokeless disposal of refuse, the patented Sealed Flame Disposal Unit, manufactured by Universal Machinery and Services Ltd., and now available on rental terms, is also being used for clean metal reclamation, says the firm, particularly in the burning-off of insulated cable and metal recovery from plastic-coated castings. The firm claims that the unit takes everything in its stride smokelessly, and that every incinerator carries with it a positive guarantee to that effect and that the performance will meet every facet of the Clean Air Act, even when operated by unskilled labor. The Home Office recently sent a load of insulated cable for test purposes, at which its officials were present, which left the metal quite clean. Another example given is that of Messrs. Peglars, of Doncaster, Yorks., where the Sealed Flame Unit is used for recovering metal from plastic coated castings. A further advantage, say the manufacturers, is that customers now have the option to either buy or rent at a nominal figure, adding that rental will often be found cheaper than recurring expensive repairs to their present inefficient incinerators.

65-0397
Smokeless incinerators burn up to 1 ton per hour. Engineering, 200(5194):599, Nov. 5, 1965.

Recently announced by Riley (IC) Products Limited, London WC1, is the refuse reducer shown. It is an addition to the company's range of Riley-Pillatt incinerators and Gaserators and is said to be suitable for burning industrial and household wastes without smoke at rates of up to 1 ton per hr. Two basic designs are produced, having one or two primary combustion chambers. Each primary chamber is a high tunnel shaped compartment with a cast iron grate formed of independent replaceable firebars. The grate is set low for easy charging and the fire bar spacing may be varied. The cast iron charging door is recessed to take refractory lining and ground on its sealing face to mate with the cast iron door frame. It measures 2 ft by 4 ft and is hinged vertically. It is also used for ashing out above and below the grate. A top mounted forced draught fan provides both primary and secondary combustion air through external ducting and nozzles, dampers affording independent air adjustment. Where two primary combustion chambers are provided, they are arranged side by side. The secondary combustion chamber with a solid hearth is situated immediately behind. It has a door similar to that in the primary chamber so that large objects that could interfere with combustion in the primary chamber can be disposed of at a slower rate. Products of combustion from both chambers are concentrated in a venturishaped orifice with refractory lining. A Riley Mk.1 oil burner plays a brilliant flame into the orifice to burn any remaining hydrocarbons. The burner is controlled by a thermocouple.

65-0398

Stirrup, F. L. Incineration. In Public cleansing; refuse disposal. Oxford, The Institute of Public Cleansing, 1965. p.87-118.

The advantages of incineration are complete destruction of combustible and organic matter, reduction of bulk, ability to operate under hygienic conditions, freedom from weather conditions, and use of residual heat. Disadvantages are need to dispose of furnace residue and unsuitable bulk, high costs, and air pollution. The basic incineration unit consists of cells, each consisting of a grate beneath a central feed opening. The receiving hopper either contains a conveyor or is composed of a simple pit from which refuse would be lifted by a grab. Dust and cinder is screened. Electromagnets remove the metals. The tailing conveyor carries the remaining to the furnace openings. Air-borne dust is extracted. The Heenan and Froude plant gives variable grate capacity by increasing the number of cells. Hot gases are drawn away in the Volund furnace. Stepped grates assist the early drying, ignition, and final combustion processes. The L. de Roll furnace provides for continuous feed via a drying hearth. The Nichols perfection grate is an American rocker type, batch fed, stoker grate built in cells with individual removable grate teeth selections. The Nichols Fuller reciprocating grate, also American, provides for continuous feed, moisture evaporation, burning and clinker removal. The refractory lining of the furnace must provide a perfect insulation and withstand heat. Firebrick is the basic liner. Furnace construction should allow for expansion and a thorough warming process. Some steam and burning material are used for power production, electricity generation, and waste heat.

65-0399

Tanner, R. The development of Von Roll incinerators. Schweizerische Bauzeitung, 83(16):251-260, Apr. 22, 1965.

In 1945, the most modern incinerator was without doubt the rotating furnace by Volund. Von Roll was licensed to construct them. But the system had many shortcomings. Fresh waste was dried by hot gases, lighted and partly burned. In the rotating drum the incineration was completed. The hot gases were returned to the flame chamber by way of a bypass duct. This was soon abandoned and the entire waste gas was used for drying. The expensive drum was exchanged for a vertical flame chamber whereby the dimensions of the incinerator were reduced. The grates were made of highly heat-resistant material. Powerful gas-tight hydraulic mechanics were developed for driving the grate. Water-cooled slag generators were installed and the slag removal was mechanized. Another improvement of this system consisted in arranging the drying grate and the main grate behind each other rather than one above the other. Further developments made it possible to adjust the incineration process to the composition of the waste and permitted the regulation of the temperature in the flame chamber. By mixing several kinds of waste a better heating value could be achieved. The boiler size was matched with the capacity of the grate. Next, the boiler was placed above the flame chamber. Blades were attached to the grate, which hit the slag in an adjustable rhythm to free it from the surrounding ashes so that it can burn down completely, which is essential for a later sanitary dumping. A number of Von Roll incinerators are described and illustrated schematically. Some statistics about the composition of waste and data on the operation of incinerators are presented in diagrams. (Text-German)

65-0400

Tip 'top city' gets new refuse disposal plant. Public Cleansing, 55(3):151-154, Mar. 1965.

Bradford, England, which has used sanitary landfills for crude refuse for about 50 years, has installed a new separation-incineration plant to conserve landfill sites. The new plant and its facilities and method of operation are described. Refuse, dumped in an enclosed area into a 100 cu yd hopper, is first screened for dust and cinder, the cinders being used for heating the plant. The manual and magnetic separation take place followed by incineration in one of 5 cell-type incinerators with hydraulically-operated grates. Clinker is collected in a travelling ship, then conveyed to a buffer storage point for truck collection. Cost of the unit was $1,200,000.

65-0401
Tope, O. Requirements for small domestic incinerators. Staedtehygiene, 16(6):141, June 1965.

To prevent further pollution of the air, domestic incinerators should only be installed when urgently needed, such as in hospitals and in department stores where an enormous amount of packing material is to be burned. At the installation of such a plant attention must be paid that each furnace receives its own chimney which must be built with especially resistant material when flue gas temperatures of more than 400 C are to be expected. The waste run-down from the various floors must be shielded off against penetration of flames and smoke. The incinerator must burn the waste entirely. An adjustable gas burner can be installed to achieve this goal. Additional equipment is necessary to prevent unburned material from escaping. Essentially the VDI (Association of German Engineers) recommendation 2301 and DIN 18160 must be observed. (Text-German)

65-0402
Waste incineration and sintering plant for Berlin Ruhleban. Staedtehygiene, 16(1):16-17, Jan. 1965.

Berlin is converting from waste disposal by dumping to incineration and subsequent sintering of the remaining slag mainly because it has no more deposition sites. Composting cannot be taken into consideration because the city has no market for it. Construction work for the incinerator plant began in October 1964 and will be completed by 1968. The plant will be able to burn about 2,000 tons of waste within 24 hr and to produce 1,000 tons of sintered material which the construction industry badly needs. (Text-German)

65-0403
Waste incineration in Germany. Brennstoff-Waerme-Kraft, 17(12):594-595, Dec. 1965.

In the course of a meeting arranged by the Institute for Water Supply and Water Quality in Stuttgart, Germany, a survey was given on the waste incinerator plants presently in operation or under construction in Germany. They are compiled in a table with all the necessary data. Basically, six different types of grate and furnace systems are in use, such as the travelling grate, roller grate, Lurgi furnace, etc. Annually, 1.8 million tons of waste can be burned which corresponds to an amount of waste of approximately 7.2 x 10 to the sixth power inhabitants. The plants still under construction will be completed by 1970, so that about 3 million tons per year will be incinerated, equal to the wastes of about 20 percent of the present population of Germany. Large plants will also incinerate industrial wastes. The plant in Essen-Karnap is experimenting with industrial wastes at the present time. (Text-German)

65-0404
The waste incinerator in Munich. Elektrizitaetswirtschaft, 64(7):184, Mar. 1965.

The waste incinerator in Munich between July 1964 and January 1965 burned 200,000 cu m of domestic waste--35 percent of the waste accumulated in this period. After completion of the second construction stage, expected in June 1966, all waste in Munich will be burned in this incinerator plant. (Text-German)

65-0405
The waste incinerator plant of the city of Den Haag. Schweizerische Bauzeitung, 83(12):203, Mar. 25, 1965.

The waste incinerator plant in Den Haag is to be built by Von Roll AG, Zurich. Three furnaces will burn more than 1,000 tons of waste daily. The steam will be used for producing electricity and the generators will yield 25,000 kilowatts of electric power. (Text-German)

65-0406
Wolf, M., and J. W. Jacobi. Waste incineration. Brennstoff-Waerme-Kraft, 17(4):186-187, Apr. 1965.

Literature published in 1964 in the area of waste incineration is listed and briefly characterized. The journals scanned are: VDI-Nachrichten, Ol- und Gasfeuerung, Handelsblatt, Mitteilungen Verein. Grosskesselberitzer, Staedtetag, Ztg kommun, Wirtschaft, Staedtehygiene, Kommunalwirtschaft, Brennstoff-Waerme-Kraft, and VDI-Zeitschrift. The list of references contains 39 titles. (Text-German)

65-0407

Wotschke, J. The development of the flame chamber melting method. Brennstoff-Waerme-Kraft, 17(8):379-382, Aug. 1965.

Several experiments were made with an incinerator operating according to the flame chamber melting method. The incinerator was filled with wetted ash to test its functioning with this almost noncombustible material; 1,380 C was necessary to melt the material in the flame chamber. The temperature characteristic during the heating up period is illustrated in a diagram. In a second experiment the incinerator was filled with very heterogeneous industrial wastes with a high amount of plastic material; 15 minutes after ignition the material began to melt; 1 hr afterwards all auxiliary burners were turned off. After the second hour all ventilators and auxiliary mechanism failed. Four hours later the disabled parts were repaired. The incineration process could be continued just by blowing air onto the still glowing waste; no auxiliary burners were required. The temperature characteristic during this process is illustrated in a diagram. Afterburner temperatures of 1,550 C to 1,600 C were measured. Incinerator capacity is 2 to 20 Gcal per hr. Continuous operation was impossible because of high thermal stress in the flame chamber and clogging of the loading duct. Construction changes to improve performance are being worked out. A schematic and description of the incinerator is given. (Text-German)

65-0408

Wuthrich, F., and R. Ropp. Electromechanical equipment for an incineration plant for household wastes in the City of Geneva. Bulletin Technique de la Suisse Romande, 91(15):243-250, July 1965.

The cities of Villette, Richeliun, and Geneva did a study of solid waste disposal, with the resulting order of an incineration plant made by Von Roll. Situated next to a hydroelectric plant, it is designed to receive solid waste from barges or from trucks. Truck wastes, which may contain bulky trash such as mattresses and washing machines, are passed through a pulverising chopper before being cycled with the wastes delivered by barge. All wastes are then lifted by clamshell buckets and dumped onto a vibrating feed hopper. The plant is equipped with two furnaces, each capable of incinerating 200 ton of wastes each day. The wastes are fed into the furnaces by the vibrating feed hopper, which is automatically controlled by an apparatus with radioactive rays, situated in the cooling shafts. The wastes catch fire at the end of the feed grill and fall onto the principal grill which, through a system of flipping bars, regulates the incineration and drops the cinders down into a canal filled with water. This residue is then transported to a storage silo for later removal. The hot fumes generated are passed through a heater to reduce corrosion, a heat exchanger, and dust filters to remove flying cinders. Special problems discussed in detail are, chimney height and fume abatement, burning of used oils, clamshell buckets, pulverising chopper, and incineration of household wastes with dried sludge. Combustion parameters of the furnaces are also discussed. (Text-French)

INDUSTRIAL WASTES

65-0409

Amberg, H. R. Aerated stabilization of board mill white water. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.525-537.

Waste treatment measures have been put into effect at the plant in Baltimore, Ohio, to improve water quality in the receiving stream, Little Walnut Creek. The mill there produces 150 to 200 tons of board and corrugating medium per day. The major source of BOD containing waste is the white water from the two paper machines. Marx Saveall and primary sedimentation lagoons remove an average of 5,811 lb of suspended solids per day or 88.9 percent of the suspended solids total. The average BOD reduction by primary treatment was 1,850 lb per day or 21 percent of the total load. The aeration lagoon removed about 5,000 lb per BOD per day. This was an average of 81 percent of the load applied to the unit. The effluent had a suspended solids content of 265 ppm and an average BOD of 97 ppm. Removal of the suspended solids by sedimentation resulted in an additional BOD reduction of about 48 ppm, making a total reduction of about 91 percent. The four surface aerators added about 5,000 lb of DO per day. The average aeration efficiency was 1.74 lb of oxygen per hp-hr. The aeration basin, operated as a completely mixed system, was very effective in handling wide fluctuations in daily BOD load. Although there was a 2.4-fold increase in BOD load the aeration basin during the 4-day survey period, the quality of the effluent was not significantly changed. Operating costs are $0.72 per ton of production or $0.0162 per lb of BOD removed.

65-0410
Andelman, J. B., M. A. Shapiro, and T. C. Ruppel. Determination of organics in water. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.220-234.

The organic constituents of water supplies were concentrated by passing the water through an activated carbon column on which the organic constituents are adsorbed. Organic water content has then been related to taste and odor. The degree of pollution of rivers has thus been compared. The extent of recoverability of organics as affected by the air-drying process was also assessed. Tap water from one of the three municipal water supplies was passed through an activated carbon filter at the rate of 0.25 to 0.5 gpm. A principal aim was the development of techniques for identification of specific organic chemicals, rather than the measurement of a total weight of recoverable material. Extracting solvents which could be removed from the extracted organics by vacuum distillation at room temperature or below were used. To determine the effect of air-drying the water-wet activated carbon on the recovery of organics, aqueous solutions of acetophenone (B.P. 202 C), one of the contaminants found in river water, were equilibrated with activated carbon. Wet and dry extractions of carbon with pyridine were carried out. Any volatile organics that might be removed with water-wet activated carbon as they evaporate during the drying process were measured. Gas chromatography was chosen as the analytical technique. A summary of acetophenone extractions from wet and air-dried carbon indicates that, within experimental error, there is no essential difference between the two techniques, either by using a single (62 to 65% recovery) or two successive (81 to 85% recovery) extractions of different aliquots of carbon with the same portion of solvent. An unexpected result was that the average of the two successive extractions implies that the second had extracted essentially all of the acetophenone from its aliquot of carbon.

65-0411
Application of digested sludge to land. Water and Waste Treatment, 10(10):519, Nov.-Dec. 1965.

There is some question as to the value of sludge manure as a fertilizer. A paper presented by E. G. Coker at a recent meeting of the Institute of Sewage Purification in Bournemouth gave authoritative backing to the claims that sewage sludge has value as a manure. This work was based on a full-scale investigation in which the liquid digested sludge was applied at rates that provide nutrients in the same amounts as artificial fertilizer. The sludge was high in nitrogen and low in potash and was used in two trials with grass and one with barley. In all the trials, the dry weight increase of grass straw and grain was the same with the sludge and with artificial fertilizer. On pure ryegrass sward the upper limit of useful nitrogen was an application of 300 lb per acre per year. Sludge produced 86 percent of the protein produced by artificial fertilizer nitrogen. Toxic effects from zinc and chromium in sludge have damaged crops which have had repeated heavy applications of dried sludge and sludge cake on acid soil. If the liquid sludge is applied at rates giving normal agricultural quantities of nitrogen (5,000 to 7,000 gal per acre), and not too frequently, there should be little hazard from the toxic metals.

65-0412
Armour, J. Municipal engineering in the United Kingdom. In American Public Works Association Yearbook, 1965. Chicago, American Public Works Association. p.212-224.

The history of municipal engineering in the United Kingdom is traced, noting the origin of the functions of the municipal engineer and the authority he serves. The municipal engineer serves a wide variety of different authorities: England, Wales, and Scotland have over 1,700 local authorities. Sludge continues to be a problem and heated sludge digestion is extensively employed and the sludge gas produced is used for heating and power production. Although most of the digested sludge is dried, there is very little demand for it. Plants have been built to convert sewage sludge mixed with municipal refuse into compost. Many British cities near the coast or vanigable rivers have special ships to dump sludge in deep water offshore, providing an economical solution to the problem. A pilot plant is being carried out at Portsmouth to give electrolytic treatment up to 300,000 gal of sewage per day. The new sewage works at Glasgow employs the activated sludge process, surface aeration type.

65-0413

Ayers, K. C., K. S. Shumate, and G. P. Hanna. Toxicity of copper to activated sludge. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.516-524.

Experiments were carried out to test various hypotheses as to the mechanisms of copper toxicity and to provide the basis for more significant interpretations of the observed effects of toxicity than have been possible. When copper-bearing sewage enters the aeration tank in the activated sewage process, there is a rapid redistribution of copper between the various available ligends (components capable of forming complexes with metal ions). Because of the insolubility of copper hydroxide at the pH values present, over 7.0, most of the copper will be in the form of the hydroxide or as a stable copper-ligend complex. A relatively constant proportion of the copper forms stable inactive complexes with sensitive cell components, e.g. respiratory enzymes. Any direct effects from the formation of metabolically inactive complexes would be observed immediately. The observed linear decrease in respiratory activity would be expected. The overall copper equilibrium in the aeration tank, and therefore, the degree of toxic effect will depend on three independent variables reflecting either copper or ligend concentrations: copper dosage, mixed liquor suspended solids, and influent sewage strength. It was therefore reasonable to find a relationship between each of these three variables and the three toxic effects as was reflected in the regression equations developed from the data. It is hypothesized that the metabolically inactive copper complexes may be reversed by dilution or by the addition of uncomplexed ligends. On being set free from the complex, the ligend (e.g. a respiratory enzyme) may revert to a metabolically active state. So the drop in respiratory rate due to copper dosage should stop soon after the dosage is stopped. This has been observed to be true.

65-0414

Azad, H. S., and D. L. King. Evaluating the effect of industrial wastes on lagoon biota. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Engineering Extension Series No. 118. p.410-422.

The toxic substances considered were copper, added as copper sulfate, and chromium, added as potassium dichromate. Copper is a common component of electroplating wastes and is widely used as copper sulfate to control the growth of unwanted aquatic plants. Chromium gets into treatment plants from many sources ranging from plating wastes to treatment for corrosion inhibition. The samples used were taken from the effluent of a bench-scale lagoon which is a 1-ft-sq plexiglass tank. The total volume of the lagoon was maintained at 20 liters and it was operated on a fill-and-draw basis for a detention time of 20 times with a loading of about 20 lb of B.O.D. per acre per day. The material fed was a synthetic sewage which has been used to maintain balanced biotic populations in a variety of laboratory treatment facilities. Copper sulfate in concentrations greater than 0.20 mg per liter seriously affect the performance of a waste-stabilization lagoon. Shock loads of hexavalent chromium at concentrations of up to 40 mg per liter were shown not to have an appreciable effect on lagoon performance. Slug doses of copper greater than 2.0 mg per and of chromium greater than 50 mg per liter reacted with the natural buffer system of the lagoon causing a significant depression of pH. This was accompanied by a gas which appeared to be carbon dioxide.

65-0415
Backmeyer, D. P. Liquid sludge disposal at Miami, Florida. Compost Science, 6(2):10-11, Summer 1965.

The city of Miami treatment plant was placed in operation in Oct. 1956. It operates with four sludge digestors which convert about 40 percent of the original solids removed into gas. This gas is used as fuel for the compressors. After digestion, disposal is achieved by vacuum filtration and incineration. The incinerators were not operated during the first 3 years of operation because of excessive costs; the cake was allowed to air dry. It was shown in 1959 that the sludge could be applied to the plant yard and non-tidal lagoons in liquid form and in April 1961, the dewatering operation was discontinued. This simple and inexpensive method was applied with very good results. Additional land has been made available for drying and storing the sludge. The dried-sludge is removed by bulldozer and placed in stock piles, available for use as a soil builder when the land is developed at a future date.

65-0416
Barbaro, R. D., and J. V. Hunter. The effect of clay minerals on surfactant biodegradability. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.189-196.

The removal of surface active agents from water supplies may be achieved by the adsorption of surfactants onto particulate matter, under natural or artificial conditions. Commonly found clay minerals such as kaolinite and bentonite are being evaluated by the Public Health Service as adsorbents. The test materials included a relatively degradable species (anionic Igopon T-77, the non-ionic Lauryl alcohol adduct and cationic cetylpyridinium bromide) and a relatively nondegradable anionic species (Ultrawet K). Twenty ppm solutions of the test surfactant and distilled water blanks were shaken with zero, 100, and 10,000 ppm of the homoionic hydrogen forms of both kaolinite and bentonite. After shaking for 2 weeks, 50 ml aliquots of the solutions were added to nutrients and buffer solution at pH 7.2. Enough activated sludge seed was added to bring the concentration to 100 ppm on a suspended solids basis. The characteristics of the homoionic hydrogen forms of both kaolinite and bentonite are shown in a table. Particle size distribution is described. Graphs show: oxygen utilization for 20 ppm anionic surfactant, 20 ppm non-ionic surfactant, and 20 ppm cationic surfactant solutions in the presence of varying amounts of clay minerals. All relatively degradable systems except the Igepon T-77-kaolinite showed a marked decrease in oxygen utilization with increase in concentration of both kaolininte and bentonite. The biological utilization of relatively degradable species of the three types of surfactants may be inhibited by small quantities of kaolinite or bentonite. This inhibition of substrate utilization is greatest in the bentonite systems. No significant effect of clay particles upon the utilization of the relatively nondegradable species of the three types of surfactants could be shown by this technique.

65-0417
Bennett, G. F., and L. L. Kempe, Oxygen transfer in biological systems. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.435-449.

Pseudomonas ovalis NRRL B-8 elaborates gluconic acid when suspended in a glucose medium that is aerated. This reaction is glucose + oxygen yields gluconic acid. The present study confirmed that in a resting cell suspension (no nitrogen) 99 percent of the glucose fermented is converted into gluconic acid by this organism. The experimental conditions are given in detail. The oxygen transfer rate in an unsparged, but agitated system was found to be less than the oxygen transfer rate in a system that is both sparged and agitated at the same time. The differences between these two measurements increase as the gas-liquid interface of the partial pressure of oxygen in the gas is increased. The data suggest that there are two parallel paths for the transfer of oxygen from air to the cell. In the unsparged liquid, the microorganism has only the oxygen dissolved in the liquid and only one path is operative. In a sparged system, another path becomes important. Some of the cells adsorb on air bubbles, or air bubbles adsorb on cells, with a consequent merging of the liquid films. This intimate contact provides a path for direct transfer of oxygen, thereby circumventing diffusional resistance of the bulk of the liquid and of one of the liquid films. Some of the resistance to oxygen transfer is reduced for some of the cells by this process and increased oxygen transfer is promoted even when the dissolved oxygen concentration is well above the critical value. The value of gas-cell contact is thus evident.

65-0418

Bloodgood, D. E. Twenty years of industrial waste treatment. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.182-188.

Trends in the disposal of wastes of the milk, packinghouse, metal plating, brewing, canning, petroleum, paper and pulp, oil, coal, and steel pickling industries are traced for the last 20 years. The number of articles dealing with specific industrial wastes has decreased. Twenty years ago a milk loss of 2 percent was common; today a milk plant cannot operate economically with a loss more than ½ of 1 percent. Whey, which was formerly a waste product in cheese plants is now made into usable food products. Spraying industrial wastes on land is now a successful method of disposal. Two decades ago, most packing-plant wastes were handled satisfactorily in municipal sewer systems, but now the adaptation of the anaerobic decomposition process is necessary to alleviate this problem. Through education the metal-plating industry has become aware of the economic loss of plating solutions. The brewing industry, like the distilling industry, has employed waste-saving devices. Sodium nitrate has been used to control odorous lagoons in the canning industry, and spray irrigation has also been utilized. In the petroleum industry, an oil separator of high efficiency has been developed. The stabilization pond has been used for the wastes of antibiotics. Paper and pulp mills, confronted with large quantities of wood sugars and color matter, have developed a process for the production of yeast from the sugar. The use of brine injection has increased oil production. Progress is being made in coal mine drainage. Several processes have been developed for the neutralization and the disposal of pickling liquors in the pickling of steel. Other wastes discussed are: pesticides, commercial detergents, and poultry.

65-0419

Blosser, R. O., and A. L. Caron. Centrifugal dewatering of primary paper industry sludge. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Engineering Extension Series No. 118. p.450-456.

A diagramatic representation of a horizontal conveyor-type centrifuge is given. Slurry to be dewatered enters through the center of a revolving bowl. The magnified gravitational force created by rotation induces suspended solids to accumulate on the bowl wall. A helical rotating in the same direction but at a slightly different speed than the bowl conveys solids along the bowl and up an inclined breach through suitably located ports. Clarified liquid is discharged through adjustable weirs located at the opposite end of the device. The increase in centrifugal force obtained by increasing bowl speed results in better solids recovery efficiency. The higher bowl speed resulted in an increased solids recovery of 4.4 percent at 1,400 gph and 5.3 percent at 4,500 gph. In every case the higher speed produced the better solids recovery. An increase of from 1.1 percent to 3.3 percent in solids recovery efficiency was found when bowl water depth was increased from ¾ to maximum depth level. There was some sacrifice in cake dryness resulting in a drop of from 1 to 4 percent in cake solids content. It is important to concentrate the sludge to the highest practical consistency before centrifuging. A drop in fed slurry dry solids from 2.18 to 1.12 percent resulted in a solids recovery efficiency drop of from 92 to 89.3 percent. The factors that must be maintained at a maximum for optimum results are therefore, bowl speed, detention time, and fed sludge consistency. The equipment has limitations: trash in the form of large chips and sticks cannot be handled (screens can eliminate this); flow rates must be held at a low level on a gpm to horsepower ratio to obtain good solids recovery. Advantages are: little supervision required; ability to handle a wide variation in fed sludge consistency; low space requirement; no need for chemical conditioning. Costs are competitive with vacuum filtration.

65-0420

Boegly, W. J., R. L. Bradshaw, F. M. Empsom, et al. Project salt vault:

radioactive waste disposal in a salt mine. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.398-409.

The fuel assemblies, after canning in Idaho, will be shipped on a specially-designed truck-trailer (illustrated) to Lyons, Kansas. There the carrier will be removed and placed vertically over a steel-cased charging shaft which extends to the mine working area about 1,000 ft below. The fuel cannisters will be lowered one at a time down the 19.1 in. waste charging shaft into a shielded cask, mounted on an underground fuel assembly transporter. The transporter will then move to the experimental area and the fuel canister will be lowered into a suitably lined and shielded 12-in. diameter, 13 ft-deep hold. The in situ heat-transfer properties of rock salt seem to be close enough to the laboratory values that confidence can be placed in theoretical heat-transfer calculations. Most bedded-salt deposits contain trapped moisture which is released by a shattering of the salt at temperatures above 250 C. This possibility can be avoided by limiting the maximum temperature of the disposal operation to 200 C. Rock salt is about equal to concrete for gamma-radiation shielding. A radiation exposure dose of 5 x 10 to the eighth power R produces some changes in the structural properties of rock salt, one of which is an almost 10 percent reduction in compressive strength. Because of the shielding characteristics of salt, this effect will be limited to the salt near the radiation source. The costs of using a salt mine facility for disposal will be on the order of 0.01 or 0.02 mills per Kwh of electricity generated.

65-0421

Boubel, R. W. Wood residue incineration in teepee burners. Circular No. 34. Corvallis, Oregon State University, 1965. 30 p.

Residue from the lumber and plywood manufacturing process is usually incinerated at the mill site in a tepee-shaped, single-walled, steel waste burner. Some practical information concerning combustion in tepee waste burners is given. This burner is not a desirable incinerator from an air pollution standpoint, but by optimizing the combustion conditions for each individual burner the pollutants can be minimized. Waste burner construction maintenance, and cost are covered. The correct firing of the burner is delineated. Appendices include a Burner Data Sheet, State of Oregon Regulations, and analysis of wood fuels.

65-0422

Bramer, H. C., and R. D. Hoak. Some observations in liquid-solids separations with particle growth. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.423-434.

The mechanism of sedimentation with suspensions of a self-coagulating clay (kaolin) was investigated using one-liter Griffin beakers on a Phipps and Bird multiple stirrer. Each beaker had a tube at the mid-point of the side wall for withdrawing samples. Suspensions of kaolin in distilled water were made by adding weighed portions to a liter of water and stirring at 100 rpm for 5 minutes. The solids remaining in suspension in 250-ml portions were measured gravimetrically. Portions were withdrawn after settling times of 1, 5, and 10 minutes from replicate initial suspensions of 100, 500, and 1,000 ppm. Settling rates were determined: (1) during quiescent settling after initial mixing; (2) during quiescent settling, following 10 minute of flocculation mixing (20 rpm) after initial mixing; (3) during mixing at 35 rpm after initial mixing; and (4) during mixing at 15 rpm after initial mixing. The data were analyzed by multiple correlation techniques o estimate the relative contribution of each of the independent variables to the observed sedimentation efficiency. The multiple regression equation is given. The coefficient of correlation of the regression equation was 0.866. The over-all coefficient of determination was 0.749 and the standard error of estimate was 12.5. The 75 percent explained variation was attributed to the independent variables as follows: initial concentration, ppm = 18.7 percent; settling time, minute = 20.9 percent; electrophoretic ability, micron per second per v per cm = 3.11 percent; electrokinetic current, micron amps = 15.4 percent stirrer speed during settling, rpm = 20.9 percent, and flocculation time, minute at 20 rpm = 21.1

percent. The results are given in three tables and nine figures and are discussed.

65-0423
Breidenbach, A. W. Surveillance for chlorinated hydrocarbon pesticides in surface waters. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.248-253.

The Public Health Service Water Pollution Control Surveillance System has 131 surface-water sampling stations on major waterways and the Great Lakes. Samples are taken as frequently as several per hr with some automated water quality equipment where pollution is a problem to as few as once or twice a year. Many different analyses are made. During the period May through December 1962 either DDT or dieldrin was identified in 38 samples from 10 rivers. These pesticides were not identified in the drainage from many agricultural areas including the Mississippi and Missouri rivers, but it is possible that they were present at levels below the sensitivity of the method used or that they were adsorbed on the suspended solids. These suspended solids were at least partially removed in the carbon adsorption sampling system then in use. Gas chromatography (more particularly microcolometric titration and electron capture detectors) made it possible to identify smaller quantities and to provide additional data to support their identification. It is now possible to measure nanogram quantities in a liter of water. The frequency of occurrence of six chlorinated hydrocarbon pesticides in several river basin areas is shown in a figure. Dieldrin was widespread. Endrin was relatively prominent in the southwest lower Mississippi, upper Mississippi, and Missouri River basins. DDT and DDE were also relatively widespread. Heptachlor and aldrin were noted less frequently. Concentrations were all in the part-per-trillion range. These presticides can become adsorbed on solids and may be expected to be associated with the suspended solids in water. The relationship of numerous plankton species to these pesticides is not understood.

65-0424
Bunch, R. L., and M. B. Ettinger. A field countercurrent extractor for water pollutants. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Engineering Extension Series No. 118. p.93-97.

A complete portable liquid extractor has been fabricated to recover organic pollutants from surface waters. In countercurrent extraction, improved efficiency is obtained by extracting the weakest sample with pure solvent and using this solvent to extract progressively stronger batches of sample. The countercurrent extractor consists of a Podbielniak model 600 SP centrifugal contactor with the necessary pumps and accessory equipment which extracts water containing finely divided silt at a combined flow of 5 gpm. The contactor is a pressure-tight cylindrical vessel with 21 perforated hands or 'elements' inside the rotor which clarify or mix the light and heavy liquid phases. The flow of the liquids through the contactor is described. Water from the river test location is pumped to a 55-gal drum that serves as a feed tank and as a clarifier for removing grit. The turbine pump on the extraction rig forces the water from the feed tank through a rotameter, through a flow control valve, and into the contactor. The flow of the solvent is described. This unit should find use in extracting carcinogenic polynuclear hydrocarbons and pesticides, and in capturing 'slug' doses of organic pollutants in river water.

65-0425
Burbank, N. C., and J. S. Kumagai. A study of pineapple cannery waste. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.365-397.

Two problems were studied: the variation in waste flows and waste characteristics for a particular pineapple cannery; and the feasibility of treatment of this waste by laboratory-scale activated sludge units. The waste-water conveyance system of a major cannery in Honolulu consists of a network of ditches located throughout the process section of the 56-acre plant. Industrial cooling waters and low BOD wastes are discharged into a stream. The remainder of the waste water, about 20 percent of which bears a high BOD converges in a single ditch and discharges into the municipal sewer for disposal by ocean outfall. The average volume of waste discharged ranged from 458 gal to 625 gal per ton of pineapples processed with a weighed average of 527 gal per ton. The average daily soluble BOD. discharged ranged from 24.1 to 32.8 lb per ton with a weighed average of 26.2 lb per ton. Washwater flows were generally of 2-hour duration with a range of 3.7 to 4.2 mgd. The waste contains high soluble carbohydrates measurable as sugar by the colorimetric method. The sugar measured for the composited samples ranged from 80 percent to 90 percent of the soluble COD. Sufficient nitrogen was presented for biological treatment. The longterm BOD determination showed the waste was non-toxic and readily degradable. For the completely mixed system, the maximum loading rates of 17.5 sugar per lb MLSS per day gave 98 percent sugar removal. The batch-fed fill and draw units gave high sludge yields in a range of 65 to 85 percent of the theoretical oxygen demand for carbohydrates. This indicated that the batch was being actively metabolized. The effluent from the continuous flow unit was turbid and odorous throughout the run. The sludge in both batch and continuous systems had poor settling characteristics. Solid-liquid separation by plain sedimentation would therefore not be satisfactory. The activated sludge system is an efficient method of removing the high soluble sugars from the waste.

65-0426

Buscavage, J. J. Research and demonstration projects in the abatement of acid mine drainage. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.664-672.

The extensive coal mining in Pennsylvania for more than 150 years has resulted in approximately 2,000 miles of streams impaired by the acid and iron in mine drainage, which are of little or no value for industrial or public consumption. The 'Appalachia Bill' was passed by the U.S. Congress to aid this economically depressed and mine drainage control legislation was passed by the Pennsylvania state legislature. The projects included: the study of the effect of coal mine drainage and other industrial wastes upon the normal chemical, bacteriological, and other biological processes by which a stream may free itself of pollution; the formation and occurrence of acids in coal mines and other coal workings and wastes, the development of procedures for reducing or preventing acid generation: and pilot plant treatment of coal mine drainage to neutralize the acid. The Monongahela River Mine Drainage Remedial Project strives to determine the sources and amounts of pollution from coal mines in this watershed, the means and cost estimates for improving its quality. The El Camion Strip Mine Reclamation Project provides technical information concerning practical method of restoring abandoned areas. The Wetmore Coal Study tests and evaluates various methods of protecting valuable resources of forest land and restoring the surface to productivity after surface mining. Retreat mining by the Christopher Coal Co., the Toms Run Project, and the Slipper Rock Creek Survey are discussed. The Coal Research Board in the Pennsylvania Department of Mines and mineral industries has provided $237,000 in the form of research and grants involving mine drainage.

65-0427

Busch, A. W. Energy, total carbon and oxygen demand. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.457-469.

Two procedures for the measurement of biodegradable organic content in terms of oxygen equivalents are described. Two other ways of measuring pollution are thermodynamic energy change and total carbon. The validity of applying thermodynamic concepts to biological systems is questioned. Total carbon changes during the process of biological oxidation using a carbon analyzer are an interesting measurement. In biological oxidation only soluble organics are of basic significance either for treatment process or pollution measurement. The ease and rapidity (about 2 hr) of the mass culture technique in conjunction with the total carbon analyzer offer an interesting development for definitive pollution measurements.

65-0428

Cairns, J. Biological concepts and industrial waste disposal problems. In Proceedings; 20th Industrial Waste

Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.49-59.

Biological concepts may be used to provide the three basic needs for any waste disposal design system: (1) a baseline reference study showing the existing pre-operation conditions against which periodic checks may be made; (2) a continuous monitoring system to check short-term effects caused by spills or changes in operating procedures; and (3) a predictive system by which the effects of a waste may be measured before its introduction into the stream itself. The pre-operation baseline study is depicted in a series of bar graphs or histograms. The average number of species obtained by unit collecting effort in a series of undisturbed or natural areas is represented by a column height of 100 percent and designated a 'healthy station'. Species are: Column I: Diatoms, blue-green algae, and green algae known to be tolerant of pollution. 4 species = 100 percent. Column II: Oligochaetes, leeches, and pulmonate snails. 6 species = 100 percent. Column III: protozoa, 41 species = 100 percent. Column IV: diatoms, red algae, green algae other than those in Column I. 81 species = 100 percent. Column V: prosobranch snails, triclad worms, and a few smaller groups. 11 species = 100 percent. Column VI: crustaceans and insects. 47 species = 100 percent. Column VII: fish. 20 species = 100 percent. The changes resulting from degrees of pollution from 'healthy', 'semi-healthy', 'polluted', and 'very polluted' are illustrated in bar graphs. The biological monitoring system checks the entire environment whereas a chemical system monitors only selected portions. A biological system integrates all the environmental variables so one sees their interaction while the chemical system records each characteristic separately. Both systems provide useful information. Monitoring systems are described and illustrated. Practical applications of biological concepts are listed.

65-0429

Canham, R. A. Solids removal in canning waste. In Proceedings; Conference on Waste Disposal for Food Processing Plants, Easton, Md., Jan. 12, 1965. University of Maryland and U.S. Department of Agriculture, Mar. 1965. p.19-26.

The canning industry is fortunate in many respects when camparing its problems with other industries. Most canning operations are seasonal. This allows a long period of rest or recovery for whatever system of waste treatment is practiced. Many canning operations are nearly rural or are located in small communities. This allows the consideration of land treatment because of location. Wastes produced by most canning operations are non-toxic to animals and crops. Canning wastes are generally not harmful to soil. The seasonal nature of the industry makes it unsound to capitalize a waste treatment facility costing in many instances more than the processing plant. A brief review of the predominant methods of treatment of canning waste reveals that lagoons or stabilization ponds, and spray irrigation are the two most popular choices. Some waste products now being utilized as stock feeds are pea vine ensilage, corn husks, cobs, and trimmings. The almost universal practice for dealing with solids first involves separation by screening. It may be possible to eliminate or make modifications of the screening process and still have a sound waste control program. The possibility of discharging unscreened waste directly to a relatively small lagoon, followed by one or more stabilization ponds in series, is discussed. Some work was done with an irrigation system where the solids were disintegrated in a comminuter and included in the spray system. This system can be used quite satisfactorily, although work needs to be done on development of the disintegration equipment to break up solids fine enough to prevent clogging of the nozzles.

65-0430

Carter, H. R. Better activated sludge - by the Kessener-brush aeration process. Civil Engineering, 35(12):67-69, Dec. 1965.

The process has the advantages of a shorter retention time, a shorter power requirement, and a degree of treatment which should make it of interest to engineers everywhere. It is a time-tested process (perhaps originated around 1914) and its value has been increased by recent improvements. Although more susceptible to upset from shock overloadings than its counterpart, the trickling filter, the activated sludge process has become increasingly popular during the last fifty years because of the flexibility of operation and its small land requirements.

Its hygienic advantages are odor and fly reduction. The oxygen supply needed has been supplied by diffused air or mechanical aeration devices, and there have been many variations in the equipment used in both these broad classifications. The Kessener brush aerator is a mechanical surface aerator. The history of the Kessenger devices is described and schematic drawings illustrate the flow in different models. Kessener emphasized not only the design of the brush rotor but also the geometric configuration of the tank in his work. The latest version of the brush rotor is described and the practical results at various sites reported.

65-0431
Cooke, W. B. Fungi in sludge digestors. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.6-17.

Two digestors were operated during the first experiment. A slurry of fish meal was mixed with raw sewage, settled in a flow-through tank and the resulting primary settled sludge added daily to one digestor as daily samples were removed for determination of quality and activity. A second portion of the settled mixture of raw sewage sludge and fish meal was fed to an activated sludge system from which excess secondary sludge was removed, mixed with the previously described primary sludge and the mixture fed to a second sludge digestor. Both digestors were operated as continuous digestors with a detention time of 16 days. They produced an average of about 700 ml of gas per g of volatile solids fed. Reduction of volatile solids was satisfactory. Six isolation methods were used. Thirty-one sets of samples of primary settled and digested sludges were processed. Of the 66 species isolated, 15 were found fairly constantly throughout the series and more frequently toward the end. Thus a population adapted to survival or growth in the environmental conditions of the sludge digestor was in the process of being selected. The yeasts and molds still present after three complete turnovers indicate that they may be taking part in the digestion process by obtaining nutrients for growth rather than merely being present in the quiescent state. After the development of a stable sludge-digestion system, many yeasts and molds are present. The use of sterile and non-sterile fish meal as a substitute for sewage solids furnished an adequate substrate for growth of filamentous fungi and for maintenance of a sludge which was still adequately digesting after 7 complete turnovers. Fungi, including yeasts and molds, are members of a population of miscellaneous microorganisms in sludge digestors as has been demonstrated in both pilot laboratory-scale digestors and in operating sludge digestors.

65-0432
Cooper, F., E. Hindin, and G. H. Dunstan. Agricultural ammonia for stuck digesters. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.126-130.

Methanogenic bacteria, which convert the salts of volatile fatty acids to methane and carbon dioxide during anaerobic digestion, are inhibited by a decrease in pH. Lime has been used to correct this although it has been said that it favors the formation of more volatile acids. Agricultural ammonia (anhydrous ammonia) has been used to restore pH since it is a more efficient neutralizing agent and in some areas is cheaper than lime. The malfunction of a 2.0 mgd biofiltration treatment plant at Pullman, Washington is described and parameters of digestion are listed. It was decided to add an amount of anhydrous ammonia to neutralize the free volatile acids and to have an effective buffering alkalinity of 550 mg per liter as calcium carbonate. The calculations used to determine the correct amount of anhydrous ammonia are given. Gas production and the pH of the supernatant increased, while the total volatile organic acid content supernatant began to decrease. Adding a calculated amount of anhydrous ammonia based on meeting the deficit caused by the free volatile organic acids in addition to giving a working free buffering alkalinity of 500 to 1000 mg per liter as calcium carbonate restored a distressed digestor having a deficit in buffering alkalinity. Buffering alkalinity of this magnitude must be added to neutralize the free volatile organic acids formed during the lag and early growth phase of the methanogenic microbiological population. Anhydrous ammonia addition brought partial relief to the distressed digestor in 5 days and complete recovery in 11 days.

65-0433
Cooper, R. C., W. J. Oswald, and J. C. Bronson. Treatment of organic industrial wastes by lagooning. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.351-364.

Oxidation ponds or lagoons have been used for the treatment of liquid industrial wastes. Three types of ponds are discribed: anaerobic, facultative, and aerobic. The rendering plant waste treatment pond in Woodland, California, is an anaerobic lagoon which has handled both relatively low and high organic loads effectively. The petroleum refinery waste pond, a 144-acre lagoon designed and built to treat wastes from an adjacent oil refinery, treats many homologues of phenol, partially oxidized water-soluble hydrocarbons, and many oxidized sulfur compounds. Data including BOD., color, and bacteria are discussed. A number of large poultry farms have successfully used anaerobic lagoons for disposal of chicken manure. Odors have frequently occurred in using lagooning for cannery wastes. Suggestions are given in regard to the construction of ponds. The type of pond selected will depend largely upon the organic and hydraulic load anticipated.

65-0434
Culotta, J. M. Treatment of cyanide and chromic acid plating wastes. Plating, 52(6):545-548, June 1965.

Three types of evaporation systems for treating cyanide and chromic acid plating wastes with consequent recovery of the plating chemicals are described and schematically illustrated. The three systems are similar in that the plating chemicals are recovered from overflow from rinse tanks by evaporative concentration of the solution. The concentrated solution is returned to the plating bath for reuse and distilled water is recirculated to the rinse tanks. Differences in the configuration of the plating line and the type of plating solution lead to variations in the typical closed loop system which permits 100 percent recovery. In the open loop system 96 percent recovery is obtained, since a minor part of the dragout overflow is not reated bt the evaporative method. This system has to be used when less than 3 rinse tanks are in line. The optimized system recovers and purifies chromic acid plating waste by evaporation and ion exchange, while utilizing waste heat to effect evaporation. Economic advantages of the techniques are cited.

65-0435
Cundy, L. Industrial waste disposal. Public Cleansing, 55(7):411-425, July 1965.

Results and analysis of a questionnaire sent to 21 British municipalities with populations between 54,000 and 1,115,000 people, concerning their involvement in disposal of industrial waste are presented. Most cities offer at least limited disposal facilities to industry. Where more than one method of disposal was offered, industry was required to segregate it's waste for disposal by the most convenient method. Many cities gave no or only partial disposal service or dangerous wastes. The central government should of necessity take control and establish a code for municipalities and industry to follow. It was recommended that local authorities offer, at industry's expense, complete disposal service for small waste producers, and incinerator ash landfill space for waste producers arge enough to operate their own incinerators. Research programs on disposal methods, and regional approaches to disposal should be initiated on a municipal-industry basis. A discussion of the paper followed.

65-0436
Davies, A. J. Public abattoir at Withybush, near Haverfordwest. Surveyor and Municipal Engineer, 125 (379):25-27, Mar. 27, 1965.

The description of the public abattoir at Withybush near Haverfordwest includes a description of the waste disposal system which will discharge a fully treated effluent to an adjacent stream. The pictures in the article show a west elevation of the abattoir, a sketch of a side view, the lairage, the beastrails and carcase saw, a ground floor plan, the sheep rails and stunning pen, but no pictures of the waste treating operations. The abattoir wastes and, especially the blood, have a high BOD. The discharge is estimated at 8,000 gal per day discharging in 4 hr. The liquid flow through the upward settling tank and humus tank has been kept down to 1 ft per hr in the 18-ft square hopper bottom tanks. Normally the flow would be 3 ft per hr. With a 30-ft diameter filter, the flow through the filter was 50 gal per cu yd per day. The sludge beds cover 360 sq yd. The effluent passes from the humus tanks to retention tanks with a capacity of 8,000 gal. This material is recirculated to the dosing syphon so that the effluent will pass through the filter and humus tank at least three times before discharge. The blood and stomach contents go directly to the sludge beds, the liquor of which is returned for treatment. This results in the blood coagulating on the beds, therefore desludging is necessary at frequent intervals, possibly twice a day. If the blood could be disposed of as a by-product, it could be stored in a blood storage tank. The cost of the sewage works was £10,709 out of a total cost of the abattoir of £52,007.

65-0437
Davis, R. V., C. E. Cooley, and A. W. Hadder. Treatment of duck wastes and their effects on the water quality in the Rappahannock River, Urbanna, Virginia. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.626-646.

Two duck farms, about 2.5 miles apart, have been discharging wastes into the Rappahannock River for the last 30 years. A map shows the location which is near Chesapeake Bay in waters used extensively for oyster production and recreation. It was estimated that treatment costs might be $.08 per duck or an annual cost of $46,000. The operation of the farms is described. The water for the flowing stream is pumped from deep wells and the ducks have access to it for 4 weeks. The waste problem is generated solely by the ducks during the period on the runs. The feathers, viscera, and feet are marketed as products and slaughtering and processing contribute little to the waste problem. Laboratory studies were carried out. Then samples were collected from six different locations and placed in six open plastic tanks (20 in. by 16 in. by 16 ft) to a depth of 14 in. Hourly samples were collected for the first 5 hr and daily for 20 days. Each sample was analyzed for BOD., solids, and coliform organisms. A marked reduction of coliform and BOD. was found at the end of 3 days and at the end of the fourth day the coliform organisms had been reduced about 93 percent. The optimum settling time for the samples was between 1.5 and 2 hr. Chlorine residuals (5-15 mg per liter) had no effect on the settling wastes. Lagooning was suggested as a method of treatment and a test lagoon (12 by 14 by 4 ft) was dug, filled with about 5,000 gal of raw waste and allowed to stand. The results obtained were not reliable because a tear in the plastic material allowed a daily seepage of about 1,000 gal.

65-0438
Dewatering of sludge. Water and Waste Treatment, 10(7):361-362, May-June 1965.

A summary is given of a paper presented by J. D. Swanwick and R. C. Baskerville at the London International Engineering Exhibition. Various aspects of dewatering of sludge by drying beds are discussed. The scarcity and cost of labor for manual lifting of sludge has been alleviated by the mechanization of beds. Benefits can also be derived from elutriation of the sludge, particularly when it is characterized by slow-draining and high specific resistance. Various depths of application of sludge between 4 and 12 in. have been used and the results suggest that the solids loading may be a more suitable parameter than hydraulic loading. The use of opaque covers has been known to reduce bed performance in summer months. The filtration characteristics of both crude and digested sludges were studied at various sewage works. It was concluded that basic data have been obtained on dewatering sewage sludges on beds both to a life table state and to a solids content of 40 percent.

65-0439
Disposal of sludges. Water and Waste Treatment, 10(7):361, May-June 1965.

The comments of Mr. V. H. Lewin at the Effluent and Water Treatment Convention are summarized. The sludge disposal problem is too frequently bypassed by the 'temporary' adoption of dumping, a cheap alternative, but of limited duration. Where sludges are nontoxic, the most economical method of disposal is consolidation and distribution to agriculture. Where agricultural use must be ruled out because of toxic content, further dewatering, even combustion to a fine ash, may be necessary. Under certain conditions, heat treatment might extend the usefulness of disposal to agriculture by rendering the material sterile and might also act as an aid to concentration of activated sludge. More needs to be known, through research, of such factors as costs, liquor effects, the foam question, and the differences apparent with varying qualities of sludge. In addition, there is a need for properly supervised dumping facilities on a national or regional basis.

65-0440

Doe, P. W., D. Benn, and L. R. Bays. Sludge concentration by freezing. Water and Sewage Works, 112(11):401-406, Nov. 1965.

The development of a process for waterworks sludge concentration by slow stirring to pre-thicken and then freezing is described. A full-size pilot plant was designed and build for a freezing and thawing cycle, which consists of an exchange of heat between frozen and thawed sludge. A detailed study of the plant showed that the tanks fatigued under the stresses caused by continual freezing and thawing. A duplicate plant was built with improved design which has a rated output of 8,500 gpd at the maximum economical output. The sludge freezing plant-stocks filtration plant and a part-sectioned sketch of the sludge freezing tank are schematically illustrated. The fundamental features of the process include: (1) raw sludge which can be collected and pre-thickened, using either mechanical means or further coagulation; (2) storage tanks to even-out input variations and give additional thickening; (3) a 'batch' process to recover latent heat; (4) a complete and slow freeze for the production of hard solids and supernatant water on thawing; and (5) tanks capable of withstanding the heavy and continual stresses caused by repetitive freezing and thawing. One thousand, six hundred fifty lb of solids per day are abstracted from 33,000 gal of bulky colloidal sludge, leaving the supernatant water to run to the river. The solids accumulate in a small area about one-eighth the size of that previously necessary for untreated sludge, and when this space is full it can be covered with soil and planted with grass. The total capital outlay of the plant was £63,000 with operating costs varying between £2.42 and L3.39 per 1,000 gal of sludge.

65-0441

Dyck, A. W. How CZC pulps sawdust in a continuous digester. Paper Industry, 47(8):44-45, Aug. 1965.

The 150 tpd capacity American Defibrator continuous digester for sawdust pulping, which was installed at a mill in Canada early in 1964, is described. Sawdust is unloaded from barges with a Colby crane and carried by belt conveyor to a blower system which delivers it to two 22 unit per hr capacity Rotex 522 screens. The screened sawdust is blown to a 360-unit concrete silo equipped with a 12-ft diameter Link-Belt turntable feeder, which moves it to a belt conveyor. It then travels to a blower and to the digester bin, which has two cone-shaped outlets to supply the twin feed-lines of the digester. Two metering screws supply sawdust from the bin outlets into two stainless steel wetting tubes with cooking liquor introduced through cyclones into the top sides. The wet sawdust passes into a high pressure feeder which delivers it by conveyor to the first digester tube. Three digester tubes are each equipped with a screw conveyor driven by a 25 hp motor at speeds between 1.5 and 6 rpm with pressure in the cross conveyor and digester tubes maintained at 150 psi, cooking temperature at 342 F, and retention time 30 to 45 minute. The cooked sawdust then passes through a blow tank and a Selectifier screen, and is subsequently washed in three stages and bleached in five stages. Two recovery furnaces operated by the mill, which together generate 500,000 lb of 600 psi steam per hr, are described. A second scrubbing system, designed for pulp mill odor control, is also described.

65-0442

Engineering in Wales--find the bugs. Engineer, 199(5160):321-322, Mar. 12, 1965.

Government DSIR grants totaling £31,420 have been given to the microbiology, mechanical engineering, and physics departments of two universities for a program of biological engineering research on the treatment of effluents and the control of corrosion in containers for fuel oil, cleaning, and cutting fluids. The first group of experiments will study methods for removing the tons of bacteria and associated solid material from the millions of gallons of water handled in town sewage and industrial waste disposal. Wastes from the coal and oil fuel industries, chemical plants, and paper making will also be studied. The second group of experiments will be concerned with growth, survival, and activity of micro-organisms in non-aqueous media such as petroleum fuel oils, cleaning and cutting fluids. It appears that micro-organisms can spoil or modify such fluids, with resultant damage to containers. It may be possible to turn this activity into a useful channel by making waste products usable. Experiments on capillary flow will be used as a basis for attempting to develop methods of concentrating and more efficiently removing solids suspended in effluents, with the hope that the work will lead to an industrial pilot plant. Collaboration between the physicist, engineer, and biologist may make possible the teaching of biology to graduate engineers from industry.

65-0443
Evans, R., K. Baumann, and F. Lewis. Sludge handling practices as related to anaerobic digesters. Water and Sewage Works, 112(4):135-138, Apr. 1965.

The results of a general study of digesters operating in 13 municipalities for the primary purpose of gathering information on everyday operating conditions, are reported. The feed sludges were analyzed and the average temperature, total solids, volatile solids, pH, and the volume handled by the digesters are reported. The mechanism of sludge digestion was reviewed. Since the organic acid-alkalinity balance is probably the most important factor in proper digestion processes, the amount of organic acids and the alkalinity (mg/l as calcium carbonate) in the fed sludge and digester sludge was determined and illustrated graphically. Without artificial agitation of digester contents, and within the temperature range of 92 to 98 F, a 30-day detention period is considered adequate for the reduction of volatile matter in normal domestic sludges. With agitation, thus increasing contact, and at optimum temperature, proper volatile matter destruction can be accomplished in 15 days or less. Tabulated data presents the displacement time and gas production observed during the study. It is emphasized that preliminary investigation indicates that the biological state of digestion might be characterized by the relative concentrations of acetic, propionic, and butyric acids. The systematic study of digesters, and subsequent preparation of case histories by the managers of sewage treatment works, will help develop tested control practices that can be applied in correcting a malfunctioning digestive process or sustaining a productive one.

65-0444
Ferber, M. Amount and composition of liquid waste. In Refuse and waste disposal. Berlin, Druckhaus Lichterfeld GmbH, 1964.

The amount and composition of domestic sewage and trade and industrial sewage are discussed. The amount of domestic sewage roughly corresponds to the consumption of water. The composition of the sewage is important for planning a sewage treatment plant. Daily fluctuations in sewage are discussed. The quantity of trade and industrial sewage can be estimated from water consumption if large amounts do not evaporate. Its composition cannot be described by average values because production processes are too variegated. For dimensioning sewage clarification plants and allocating the corresponding operating costs, the sewage pollution is expressed in inhabitant equivalents.

65-0445
Finstein, M. S., and H. Heuelekian. Filamentous micro-organisms and the bulking of activated sludge. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.175-181.

Aeration tank mixed liquors from four activated sludge sewage treatment plants were examined to provide quantitative data to assess the influence of filamentous microorganisms on the settleability of activated sludges. One of the four plants operates with a mixed liquor suspended solids concentration of about 1,300 mg per liter and a detention time of 1.5 hr. The others are conventional plants with detention time of about 6 hr. Flocs were characterized with respect to their diameters and the total length of associated filamentous microorganisms per flox. Flocs generally range from 0.02 to 0.2 mm in diameter. The total length of filaments per floc ranged from 0 to about 2.0 mm. In any given sample the population of flocs was extremely heterogeneous with respect to the characteristics measured. No consistent relationship was found between floc diameter and sludge volume index (SVI). Of samples taken from a specific treatment plant at different times, the more filamentous sample always add the higher SVI. SVI was also, at two plants, related to the mean total length of filaments per floc by a constant factor. Because of this evidence it is inferred that filaments govern SVI to a large extent.

65-0446

Flower, W. A. Spray irrigation - a positive approach to a perplexing problem. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.679-683.

The Howard Paper Mills of Urbana, Ohio, seeking treatment of its industrial waste, would provide 85 percent BOD. reduction, would be economical, and would be free of nuisance conditions, considered the use of spray irrigation, although the numerous pitfalls and large expenditure of money were detracting factors. In order to determine the feasibility of using spray irrigation for waste disposal, a pilot project was set up which investigated; (1) What cover crop was most suitable? (2) How much land would be required? (3) How much attention would it need? (4) How much water could be applied? (5) What is the tolerance of the cover crop to waste materials? (6) Would ground water become polluted? and (7) How to dispose of the cover crop when harvested? The permeability of the soil was determined. Alfalfa was selected because it has a particularly high transpiration rate, has a massive root structure, and withstands the stress of sprinkling. The fine-bladed grasses such as orchard or bent grasses were found to serve as excellent cover crops, requiring less care, although offering no economic return. The alfalfa was completely destroyed at the end of 5 days (20 in. of water), indicating the need for constant attention in operating a spray irrigation system. Testing under cold weather conditions confirmed that spray irrigation is strictly a warm-to moderate-temperature operation. Sampling of test wells indicated no correlation between the well water and the waste applied, with the exception of BOD. Based on the experience of the pilot plant, full-scale operation of a 117-acre spray irrigation system providing 100 percent treatment of wastes from the mill will begin.

65-0447

Follett, R. H. Plastic trickling filter--activated sludge treatment of paper wastes. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.120-125.

A combination of a roughing plastic media trickling filter and activated sludge process was tested as a method of secondary biological treatment. The pilot plant was operated over a 2 year period, treating settled effluent from a fine papermill, boardmill, and a papermill employing deinking. The pilot plant was operated with each waste, first as an activated sludge unit alone and, when its performance was determined, at increasing loading levels. The return sludge and the feed were switched to the filter starting at a low rate of application. Graphs show: series trickling filter treatment, activated sludge verus combined treatment of fine papermill waste, activated sludge versus combined treatment of deinking papermill waste, and combined treatment of boardmill waste. Capital cost comparisons were made of the two systems, and the data indicate that combined treatment plants can be built at from 5 to 25 percent less than the cost of activated sludge plants. Besides better performance and reduced cost the combination system improved the settleability of the activated sludge while treating fine papermill effluent. The trickling filter can be used as a cooling tower to cool hot waste to be treated by the activated sludge unit. The amount of activated sludge produced was about the same for the two treatment methods, (generally 0.5 lb dry solids per lb of BOD. removed) with the same dewatering characteristics. Recirculation of activated sludge to the trickling filter increased the efficiency of the unit. The greatest advantage of the combined system is the uniformity of performance at high loading rates.

65-0448

Goodman, B. L., and C. P. Witcher. Polymer-aided sludge elutriation and filtration. Journal of the Water Pollution Control Federation, 37(12):1643-1656, Dec. 1965.

Despite past failures, the elutriation system is being made to function properly in Ann Arbor, Michigan, to remedy present sludge disposal problems. Single-stage elutriation must be employed to reduce the concentration of sludge alkalinity. This sort of dilution is either fill and draw or continuous. Sludge can also be taken through a multistage operation or elutriation can be carried out in two steps in which the recovered wash water from the second step is returned for reuse in the first step. Addition of alum proved ineffective for countercurrent elutriation units. Because of individual sludge variations, no specific elutriation system design criteria is possible. Ann Arbor studies revealed that utilizing cationic, synthetic polymers of high molecular weight could overcome expected shifts in the efficiency of properly designed units. Tests of various polymers were undertaken and results plotted as percent recovery of wash water vs. time. As data show, different polymers were best for different needs. Reten 205M, for example, improves the sludge's settling characteristics and increases the unit efficiency at a variety of elutriation ratios. To date, no basis has been established for predicting the effectiveness of a particular polymer for conditioning a particular sludge. Generally, sludges which can be conditioned easily with conventional inorganic coagulants also can be conditioned easily and cheaply with polymers. It also appears that polymer-conditioned sludge can only be dewatered with top- loading filters. Various synthetic polymers aid in sludge conditioning, elutriation, sludge index control, and pressure flotation.

65-0449

Grieves, R. B., K. Y. Shih, T. E. Wilson, et al. Ion flotation for industrial wastes: separation of hexavalent chromium. In Proceedings; 20th Industrial Waste Conference, Purdue University, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.110-119.

Ion flotation, which involves the formation of a surface-active complex by means of the addition of a surface-active ion of opposite charge to separated, has been employed for the removal of organic anions and cations from aqueous solution. The complex is floated to the surface by generated gas bubbles. If the complex is soluble it may be termed foam separation. If the complex is insoluble and is floated from solution in the form of colloidal-size particulates, the process may be termed ion flotation. The feasibility of ion flotation for the separation of hexavalent chromium from aqueous solution, using a cationic surfactant which forms an insoluble complex with dichromate iron, was investigated. Batch and continuous flow experiments were included, with major emphasis placed upon the effects of dichromate concentration and surfactant concentration. In both sets of experiments, the addition of the ethylhexadecyldimethylammonium bromide to the potassium dichromate solution produced a distinct cloudiness, indicating the formation of fine, colloidal particulates consisting of complexed dichromate and EHDA ion. A second set of batch experiments was conducted to determine the influence of pH upon the ion flotation of dichromate and to establish any interference that other anions might have upon the removal of dichromate. Based on the limited number of experiments; the ion flotation of dichromate appears to be feasible for the separation and concentration of hexavalent chromium from aqueous solutions. With batch operation, lower residuals of dichromate and of surfactant were obtained than with continuous operation; however, the pulsed feed of surfactant which was used would be analogous to multicolumn operation on a continuous basis.

65-0450

Grune, W. N. Automation of sludge digestor operation. Part 1. Journal of the Water Pollution Control Federation, 37(3):353-380, Mar. 1965.

It was shown that sludge disposal construction costs range from 25 to 54 percent of the total treatment plant investment. As research studies become more complex while funds remain limited, it appears automation will become more important in the future. Three new parameters were studied to improve the control of sludge digestion. Anaerobic process automation by oxidation-reduction potential, liquid conductivity, and gas chromatography appears feasible. These new methods were employed to measure the gases given off to the atmosphere, the liquids which ultimately enter the stream, and the solids which are returned to the soil. The following results were obtained: Redox-potential can be used to measure the emf of the system for long periods of time; trends in redox-potential are reproducible; and there exists a direct relationship between redox-potential and cumulative gas production. Liquid conductivity allows much to be predicted about the state of sludge and there is a correlation between conductivity, total solids, and the degree of composition of a sludge mixture. Gas chromatography can continuously analyze each of the components present in sludge digestion gas, and be interpreted by the 'peak height fraction' method when a liquid partition column is used. It was found by the gas chromatography method that the carbon dioxide concentration was 30 percent or less by volume and that neither hydrogen or hydrogen sulfide was found in the seeded sludge mixtures. The need for new and better systems exists and such systems are in various stages of development.

65-0451

Hanes, B. N., G. A. Delaney, and C. J. O'Leary. Relationship between Escherichia Coli, type I, coliform and enterococci in water. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.210-219.

The most satisfactory method for bacterial evaluation of water is to use an indicator organism. The two kinds of bacteria found in fecal material that may be used as indicators are the coliform and the enterococci groups. Although the coliform group has many advantages as an indicator, their ubiquitous nature prevents their indicating fecal contamination, and they may even multiply in water. Although the enterococci group have been of little use because of the difficulty in testing and their small numbers in sewage, the recent use of sodium azide as an inhibitor has developed a simple test for them. Graphs show: the logarithmic death phase for two indicator bacteria; survival curves for coliform and Escherichia coli, type I, the relationship between coliform and enterococci; and the relationship between Escherichia coli, type I, and enterococci. Although many authors have concluded that the presence of either enterococci or E. coli, type I, in water indicates fecal contamination, they are present in animal feces exposed to streams; therefore the presence of these bacteria will not indicate a dangerous public health condition. A definite equation cannot be developed for the relationship between enterococci and the coliform group or E. coli, type I, because the relationship will vary with the source of contamination. A graphical relationship between E. coli, type I, and enterococci may be used to differentiate between human fecal contamination and fecal contamination of other warm blooded animals in stream water.

65-0452

Hann, R. W., and F. D. Callcott. A comprehensive survey of industrial waste pollution in South Carolina. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.538-550.

The three major phases of the study were: locating the industries and getting basic information about them; studying the specific industrial processes through questionnaires and visits; and cataloging the present waste treatment facilities and evaluating industrial waste loading. The textile industry is of paramount importance: one-third of the country's textile spinning and weaving and 50 percent of the country's textile finishing is done in South Carolina. Other significant industrial groups are: the pulp and paper industry, food processing, and metal plating. A cotton weaving flow diagram is given. The distribution of grey goods producers throughout the state is shown on a map. Similar figures are given for textile finishing, wool processing, and paper making. A map showing the treated and untreated effluents from textile finishing is presented. The present status of waste disposal for each industry is summarized. The population equivalents for 11 river basins are given for the major industrial groups of textile, pulp and paper, food processing, and electroplating.

The total population equivalent is 4,576,300.

65-0453
Hanna, G. P., W. D. Sheets, P. J. Weaver, et al. A field study of LAS biodegradation by modified activated sludge. In Proceedings; 20th Industrial aste Conference. Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.725-734.

A 16-month study sponsored by the Proctor and Gamble Co. at Ohio State University has confirmed the biodegradability of the new linear alkyl sulfonate (LAS) and its biodegradability was compared to that of alkyl benzene sulfonate-(ABS) based products now being replaced by LAS. The test site consisted of 88 homes. Each home was provided with detergent formulations of known composition. The original treatment plant utilizes a modified activated-sludge or extended aeration type of treatment. The receiving stream is variable in flow. Sigma pump units were used for automatic collecting raw influent and final effluent samples. The main operational variables considered were type of surfactant, variation in aeration time and mixed liquor suspended solids. The program was divided into 3 major parts: operation with home owners' normal purchase product, a test of ABS biodegradability, and a test of LAS biodegradability. In each of the tests, attempts were made to vary the condition so that the biodegradability at different aeration times in mixed liquor suspended solids levels would be obtained. LAS was found to be much improved in biodegradability over ABS for all comparable operating conditions. The efficiency of removal of LAS is proportional to the contact time in the aeration tank. LAS shows an acclimatization to aerobic digestion, and an increase in degradability with a corresponding increase in detention time and mixed liquor suspended solids. LAS removals appear to be better than overall BOD and COD removals, and under conditions when the plant was operating efficiently and after acclimatization were comparable to soluble BOD removals.

65-0454
Harding, J. C., and G. E. Griffin. Sludge disposal by wet air oxidation at a five MGD plant. Journal of the Water Pollution Control Federation, 37(8):1134-1141, Aug. 1965.

The modernizing project at the Blind Brook District plant, Rye, New York, was to adapt it to wet air oxidation of sludge. Wet air oxidation is a process in which oxygen in air, under greater-than-atmospheric pressure, combines with organic material in aqueous solution or suspension below the critical temperature (372 C) at which water ceases to be in a liquid phase. The modernized project consists essentially of: (1) a disintegrator to reduce particle size; (2) a storage tank for preliminary heating; (3) a steam generator to furnish start-up heat; (4) a centrifical pump for transfer of sludge from the storage tank; (5) a high-pressure pump to increase the pressure for the heat exchangers; (6) an internal diam reactor; (7) a separator which separates gaseous products from the liquid and solid portions of the reaction product; (8) a diffuser or perforated bottle to mix vapor-phase products with the wastewater flow; (9) pressure-reducing valves and liquid-level controllers; and (10) an ash-separation tank in which the solids portion of the residue is settled and from which the ash is discharged to a drainage bed. Air at the required pressure is supplied by a three-stage reciprocating compressor. An instrument panel monitors all operating data. It was found that operation of the unit was necessary only on 4 or 5 days of alternate weeks. This process is an economical and appealing solution of the sludge-handling problem for small plants. Additional operating data is contained in this report.

65-0455
Hetling, L. J., and D. R. Washington. Kinetics of the steady-state bacterial culture III. Growing rate. In proceedings; 20th Industrial Waste Conference, Lafayette, Inc., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.254-264.

The relationship between the rate of growth of the microorganism and the substrate concentration in the system is one of the more important relationships in the design of a biochemical waste treatment process. The literature shows that both biologists and engineers disagree on this relationship. The purpose of this research was to determine under laboratory conditions the relationship of substrate concentration to growth rate where the substrate concentration is measured as COD. An open, homogeneous, continuous culture-apparatus was constructed and operated under various growth conditions using different organisms and substrates. Pure cultures of bacteria were used to maintain a steady-state. The continous culture, completely mixed, activated-sludge system in its simplest form consists of a reaction vessel to which medium with a fixed substrate concentration is added at a constant flow rate and with a constant volume. The temperature, pH, pressure, and other environmental conditions were considered to be constant. Graphs show the effect of dilution rate of dissolved COD using various substrates. The effective growth rate was found to be equal to the dilution rate. Although the data indicated that the constants involved are unique to each combination of substrate and organism, the general relationships apply to any predominantly microbacterial process. For an industrial waste treatment process the constants would be different for each waste.

65-0456
Hurwitz, E., G. H. Teletzke, and W. B. Gitchel. Wet air oxidation of sewage sludge. Water and Sewage Works, 112(8): 298-305, Aug. 1965.

The characteristics of several sludges oxidized to various degrees are reported. Solids from low degree as well as high degree oxidations exhibit qualities such as sterility, biological stability, settleability, and drainability which make the end products suitable for ultimate disposal. The choice of degree of oxidation will, therefore, depend on consideration of factors specific to the local situation such as the size of the plant, availability of land for ultimate disposal, power costs, etc. The wet air oxidation process offers a wide selection of end products and disposal process now available. The relationships of COD reduction to temperature, insoluble organic reduction, volatile solids, settled oxidized solids, and BOD. exertion are graphically illustrated.

65-0457
Illegal dumping cause of coal mine fires. Refuse Removal Journal, 8(1):14, Jan. 1965.

Waste disposal investigators of the Pennsylvania Mines and Mineral Industries Department have been instructed to enforce a 1956 State Act which provides for the regulation of refuse disposal areas in the anthracite and bituminous coal regions in order to prevent the ignition of fires. The sections will be surveyed to determine that permits have been issued to cover all areas where rubbish is being dumped. It is thought that the major portion of the mine and refuse bank fires now burning in these coal regions may have been started by the ignition of refuse dumped in the areas. These fires are annoying to nearby residents, as well as costly to extinguish. Notices will be posted on land not licensed and where trash is being dumped, indicating that the spot is not a licensed waste disposal area. Mine inspectors are to observe refuse disposal areas in their districts and to report infractions. Any person or property owner using land as a waste disposal area without a permit will be reported and will be subject to prosecution.

65-0458
Industrial solid waste disposal practices in England. Public Works, 96(9):66, Sept. 1965.

Questionnaires concerning problems and methods for industrial solid waste disposal were sent to 21 local authorities in England and replies received from 18 of them. Eight said that their authority offers facilities to industry for the disposal of its wastes; nine said they did, with qualifications; one said it did not. As to the methods employed, eight provided controlled tipping and six used a combination of controlled tipping and incineration. In regard to contemplated changes, eight did not plan any changes; eight were considering the provision of further facilities, including separation and incineration, pulverizing, or composting. Dangerous or difficult substances were not accepted by five of the respondents; seven reported limited acceptances; and six had no limitations. As to quantity or tonnage, three kept no records; the others reported amounts ranging from 2,000 to 57,000 tons annually. Other replies indicated that industry also disposed of wastes privately and that the method, where known, was mainly tipping.

65-0459
Industrial waste collection at West Bromwich. Public Cleansing, 55(5):282-286, May 1965.

West Bromwich, England, has instituted a municipally-controlled industrial waste disposal system utilizing the Dempster system. Many municipalities require industry to dispose of their own wastes, which is usually done by open burning or open dumping. By renting the containers at $2 per week and charging $7 per visit for refuse removal, the system supports itslef, ad, allows the municipality to control the place and manner of dumping. Sixty 8-yd containers are in use, and two dumpsters empty all but five of the containers on a daily basis.

65-0460
Jensen, C. L. Industrial wastes from seafood plants in the state of Alaska. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.329-350.

The wastes from the seafood plants in Alaska in 1964 were: salmon, 103 million lb; king crab, 69.5 million lb; dungeness, 10 million lb; shrimp, 5.5 million lb; and halibut, 3.4 million lb. This cost the processors over $21 million. A 4-year average of costs was $16 per year. Fish meal made of herring, anchovies, tuna offal, and menhaden is sold for $130 to $160 a ton. Although king crab waste contains calcium, iron, magnesium, manganese, zinc, and copper (all essential for good crops), it contains little protein. The other elements could be used in the fertilizer industry. The salmon industry spends almost $48 million for its raw material and throws away 30 percent as waste. The vast amounts of fishery wastes (190 million lb in 1964) should be of interest to the fish meal industry. These wastes are being dumped in Alaskan waters and are a potentially dangerous pollution problem. The wastes are particularly dangerous to the shellfish industry which requires relatively pure salt water for live tanking purposes. The paramount problem is the great distances between primary production points. At the primary plant a storage system would have to be provided to handle the day-to-day production of waste which would later be collected by barges capable of carrying several tons. Primary reduction units might be installed at the primary source of raw material. Primary drying and dry storage might lead to a problem of spontaneous combustion. The waste might be reduced chemically to a thick type of slurry which could be stored for pumping into the barges.

65-0461
Jones, P. H. The effect of nitrogen and phosphorus compounds on one of the micro-organisms responsible for sludge bulking. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.297-315.

Evidence is offered that a variety of filamentous microorganisms are intimately associated with the sludge bulking phenomenon. Mixed liquor was obtained from a sewage treatment plant in Chicago and was fed a synthetic sewage rich in carbohydrates. The equipment consisted of 4 liter aspirator bottles with magnetic stirrers and magnets. The cultures were aerated and the temperature measured. The effect on growth rate of a cross-section of organic and inorganic nitrogen sources when combined with a series of different carbon sources was studied. Experiments were designed to study the effect of nitrogen deficiency on the growth rate of Geotrichum and at what concentration of nitrogen (BOD/N) this nutrient became the limiting factor. These experiments were done in three series; in each series a single nitrogen source was considered and the BOD/N ratio was varied from 25 per liter down to 500 per liter. The effect of higher BOD per P ratios on the specific growth rate was yielded by the organic nitrogen sources, peptone and hydrolyzed casein and the lowest growth rate by nitrate nitrogen. From these experiments it was noted that the effect of the nitrogen source is also related to the carbon source available. A second series of tests using the anionic synthetic detergent, alkyl benzene sulphonate, and the non ionic synthetic detergent 'Energetic' is reported.
A BOD per P ratio of 100 is the maximum tolerable for activated sludge. It was deduced that in phosphorus or nitrogen deficient wastes Geotrichum has an advantage over other microorganisms.

65-0462
Jones, P. H. Waste treatment in the urban society. Canadian Medical Association Journal, 93:26-32, July 3, 1965.

In order to reuse water which has been used as a vehicle for wastes in sewers, it is necessary to remove the wastes from the water. This review discusses the functions of the modern sewage treatment plant. Wastes are treated for two distinct purposes; to separate water from putrescible organic material, both dissolved and particulate and to disinfect the water to prevent the transmission of water-borne pathogens. The separation of solids is accomplished by flocculation followed by settling. The flocculation may be induced biologically or chemically, with the former method the more economical where practical. The methods of bioflocculation described include the following: activated sludge, contact stabilization, tapered aeration, step aeration, total oxidation, and trickling filter. The non-mechanical methods of sewage treatment are economically and technically sound in areas where the sewage flow is small and the land costs are low, as is the case in many rural applications. The lagoon or oxidation pond resembles the total-oxidation or extended aeration method except that the air used is that dissolved from the atmosphere. In Ontario, regulations require that sewage be detained in the oxidation pond for 80 to 100 days before release to the receiving stream. The choice of a method for waste treatment must be based on the type of waste to be treated, the fluctuation in waste quality and quantity, the degree of treatment required, and the relative economics of the methods considered.

65-0463
Joyce, R. S., and V. A. Sukenik. Feasibility of granular, activated-carbon adsorption for waste-water renovation. In Environmental health series, water supply and pollution control. AWTR-15. [Washington], U.S. Department of Health, Education, and Welfare, Oct. 1965. p.1-38.

Granular, activated carbon in packed-bed column contactors 20 ft deep and operated at a flow rate of 4 gpm per sq ft reduced the COD to an average value of 18.5 ppm. The removal was not significantly different from the removal obtained when operating the same column at 10 gpm per sq ft. After 4 months of operation, the first quarter of the column length was still accomplishing a significant part of the overall removal. Typical adsorption isotherms for type SGL carbon for COD indicated capacities of approximately 35 percent by weight. The cyclic saturation and regeneration of activated carbon through 16 cycles had an average carbon loss of 4.6 percent per cycle. A practical adsorption capacity was maintained for the regenerated carbon even though reactivation conditions for carbon spent on municipal waste-water treatment purification have not been explored and optimized. Flocculation with alum of secondary effluent prior to carbon adsorption increased the adsorption capacity of the carbon and resulted in much lower final levels of COD than the levels obtained with unflocculated effluent. The report includes explanatory tables and figures.

65-0464
Kershaw, M. A. Development in sludge treatment and disposal at the Maple Lodge Works, England. Journal of the Water Pollution Control Federation, 37(5):674-691, May 1965.

Sludge treatment and disposal present an entirely different problem from disposal of sewage effluent. This paper deals with the work of the West Hertfordshire Main Authority in the field of sludge disposal. The main treatment plant rests over a large reservoir of underground water, causing some problems. Following a visit to America, it was decided to install a heat treatment and vacuum filtration system, the only flash-drying plant in England. This system was not adequate to handle all the sludge which entered the plant and sludge treated did not justify operating costs. Excess liquid digested sludge is transported by tanker trucks to local farmers without charge for use as a soil builder. Sludge drying beds looked to be the best solution, but labor shortage was a problem, thus the beds were installed with a nearly completely automated system of handling. It has mechanical gear for lifting, a conveyor system for transporting, and a stockpile area. Charts give the cost and production of sludge and rainfall. A detailed description of sludge drying facilities is given. These sludge beds have operated successfully for the first year of operation.

Though more expensive, the drying method provides a more satisfactory means of sludge disposal and will give the most desirable measure of flexibility of operation.

65-0465

Kiefer, B. The joint elimination of sewage sludge and waste. Staedtehygiene, 16(8):179-181, Aug. 1965.

At a meeting of the work group for Baden Wuerttemberg of the German Water Pollution Control Association, the purification and incineration plant which is presently being constructed in Ebingen was discussed. The costs of the plant are estimated to amount to about 12 million DM. The purification plant will consist of a trash rack, a sand filter, 4 settling tanks, one accelerator (38.20 m in diameter), and one cyclator (33.80 m in diameter). The waste will first be crushed in a hammer mill and the iron parts separated by magnet. The waste thus prepared for incineration goes to a storage room. A conveyor belt brings the waste to the furnace which consists of several compartments. The sludge from the purification plant is dehydrated to a water content of 60 to 65 percent and passed to the uppermost compartment of the furnace. One hundred tons of waste are added to 36 tons of sludge. In the upper compartments the sludge is dried. The waste goes directly to the incineration compartment which is located in the center of the furnace. The operating costs of the plant are calculated to be 4.10 DM per cu m of sludge and 9.30 DM per ton of waste. (Text-German)

65-0466

Kincannon, D. F., and A. F. Gaudy. Some effects of high salt concentrations on activated sludge. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.316-328.

Batch activated sludge units were developed from an initial sewage seed using a synthetic waste. To determine the effects of slug doses of salt, the mixed liquor from a batch unit was divided into two equal parts. Both new units were then fed the standard waste and one was shock-loaded with the salt concentration under study. The 'fresh water' unit was retained as a control. Samples were also taken to measure the carbohydrate and protein contents of the sludge. The degree of cell lysis accompanying changes in salt concentration was studied. The response of a fresh water activated sludge to slug does of sodium chloride of 30,000 mg per liter and 45,000 mg per liter is shown in graphs. The former dosage caused some retardation in the rate of substrate removal as compared to the fresh water control. The solids production in the salt unit was only 76 percent of that in the control. The concentration of 45,000 mg per liter sodium chloride affected the biochemical response of the sludge more severely, causing a considerable degree of lysis and an increase in COD. Data indicates that considerable amounts of metabolic intermediates or end products are released during glucose metabolism. Changes in carbohydrate and protein content of the sludge during the aeration period for batch activated sludges acclimated to various salt concentrations are compared to those growing in fresh water medium. The effects of placing cells grown in NaCl in lower salt concentrations and in fresh water medium are shown. At a cell concentration of 555 mg per liter, the maximum COD released was 90 mg per liter for cells grown in 45,000 mg per liter sodium chloride. A linear relationship exists between the change in salt concentration and the degree of lysis. When sludge acclimated to 45,000 mg per liter sodium chloride was placed in fresh water the substrate removal efficiency of the system was almost entirely disrupted.

65-0467

Knapp, J. W., and J. M. Morgan. Biodegradability of detergents at Manassas Air Force Station. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.737-745.

A field study of the comparative removal efficiencies of ABS and LAS detergents was conducted during the summer of 1964 at the Manassas Air Force Station near Manassas, Virginia. The treatment plant is shown in a schematic and described. In Phase I, background data were gathered on plant operating conditions and detergent removals. At the beginning of Phase II the plant was emptied and LAS products were distributed station-wide. Phase III was similar to Phase I but with only LAS products in use. No significant foaming was observed in any of the test phases. Influent and effluent concentrations of MBAS for the principal test phases are represented by three-day moving averages shown in a graph. Increased usage did not result in raised MBAS concentrations entering the plant, in fact, at the beginning of Phase III the influent concentrations had fallen to unexpected low levels. After 18 days of observing low concentrations of active material, a supplemental feed of LAS was added to the plant. Supplemental loading was continued and was designated Phase IIIB. Average concentration and removals for the principal phases are shown in a table. Effluent concentrations of MBAS during the LAS phases were less than one-half of the effluent concentrations during the ABS phase. The distribution of MBAS and BOD sample concentrations in the influent and in the effluent are summarized in tables. The relative inefficiency of ABS degradation during Phase I is portrayed. Throughout the LAS phases, samples were subjected to infrared analysis. The 3-month study confirmed the improved biodegradability of LAS detergent products.

65-0468

Knopp, P. V., L. J. Uhren, M. S. Nichols, et al. Kettle moraine field study. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.745-754.

The removal of ABS and LAS were compared by an 'extended aeration' activated sludge plant under field conditions. The efficiency of LAS removal was measured under good and poor operating conditions. The Kettle Moraine Boys' School and its sewage treatment plant (shown in a schematic) is described. The percent removal of MBAS, suspended solids, BOD, the DO of the mixed liquor, the return sludge suspended solids, average daily flow, recirculation flow, and aeration rate are summarized. The percent removal of MBAS and BOD are plotted. Phase II, in which detergents containing ABS were in use was characterized by high (approximately 8,000 mg per liter) mixed liquor suspended-solids concentration in the aeration tank, and high aeration and recirculation rates. Average effluent MBAS concentration was approximately 1.0 mg per liter, the average MBAS removal was 89.9 percent while the average BOD removal was 97.2 percent. During Phase IV, the aeration rate and the recirculation rate were increased to the conditions of Phase II. The MLSS, however, was 3,500 mg per liter as compared to 8,400 mg per liter during Phase II. During the first few days of Phase IV, a filamentous growth developed in the sludge which cleared up prior to the sudden drop in effluent MBAS concentration suggesting that lower effluent MBAS concentrations might have occurred earlier in Phase IV if the poor settling characteristics had not developed. At the beginning of Phase V the aeration rate was reduced and the recirculation rate was set to equal that of Phase II and IV. The mixed liquor dissolved oxygen decreased to zero and solids were lost in the effluent.

65-0469

Liquid digested sludge as manure. Water and Waste Treatment, 10(6):301, Mar.-Apr. 1965.

Sludge disposal in a manner that is valuable to the agricultural community has been a problem for some time. In a paper presented by E. G. Coker to a meeting of the Institute of Sewage Purification at Cambridge, it was recommended that sewage sludge be disposed of after digestion by application in the liquid form to grassland or agricultural crops. Liquid digested sludge was applied at rates sufficient to supply the same quantities of nutrients as contained in commercial artificial fertilizers and the results were compared with those obtained by artificial fertilizers. The effect of using supplementary potash fertilizers was also determined. In all the tests, the liquid digested sludge gave an increase in dry matter similar to that produced by equivalent amounts of nitrogenous fertilizer. The average amount of nitrogen taken up from liquid digested sludge was 86.3 percent of that taken up from equivalent artificial fertilizers. The liquid digested sludge gave a marked stimulus to growth of ryegrass in comparatively dry summer conditions by providing water to carry the nitrogen into the turf. Less positive results with air dried sludge could have been caused by the loss of soluble nitrogen during drying. Any ill effects from the use of sludge may be minimized by a thin spreading of the sludge at infrequent intervals. These results should be helpful in making the use of liquid digested sludge more acceptable to farmers.

65-0470
Lively, L., A. A. Rosen, and C. I. Mashni. Identification of petroleum products in water. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.657-663.

Methods for hydrocarbon pollution include: gravimetric and volumetric analyses, mass spectrometry, and infrared spectrometry. Sampling procedures are described: the carbon adsorption method and liquid-liquid extraction proved the most suitable. The analytical methods described were used to identify the petroleum products found in four incidents caused by hydrocarbon pollution. The investigations are given in the form of case histories. One incident involved a private well serving a country store. The well water was reported to have a gaseous taste and a gasoline-like odor. The identity and concentration of the pollutants found are summarized in a table. The components detected constituted a molecular range much narrower than is typical of gasoline. This range agrees with a number of solvents: petroleum ether, rubber solvent, and crude hexane. Hydrocarbons were shown to be responsible but the specific hydrocarbon product was not identified. Other case histories involve incidents with gasoline pollution, kerosene pollution, and fuel oil.

65-0471
Loehr, R. C., and T. J. Kukar. Removal of lipids by conventional waste treatment methods. International Journal of Air and Water Pollution, 9(7/8):479-485, Aug. 1965.

Although little is known of the organic compounds introduced into surface waters as effluent from domestic wastes, it is known that the lipids, because of their insolubility in water are removed to a lesser extent than the more soluble organic compounds. To obtain a better understanding of lipid degradation and removal pattern, the lipid content from samples of sludges and treated and untreated sewage was extracted and identified using column, thin layer and gas-liquid chromatographic techniques. The lipid classes in the purified lipid extract in percent are shown for these samples in a table. Although primary treatment removes lipids that are able to settle or float, it does not alter the proportion of any one specific lipid class and the same lipid classes were present in the raw and settled sewages in the same proportion. Biological waste treatment decreased the percent of the methyl esters, fatty acids, triglycerides, and sterols as the lipids were adsorbed to the sludge particles and metabolized. The treated and untreated sewage, activated return sludge, digester supernatant, and digested sludge showed no methyl esters or fatty acids with less than 16 carbon atoms and no hydrocarbons with less than 18 carbons. Although biological treatment decreased the amount, all eight classes of lipids were discharged in the effluent from the Topeka treatment plant. Seventy-five percent of the lipids in the effluent consisted of saturated hydrocarbons, triglycerides, fatty acids, sterols, and compound lipids.

65-0472
Luley, H. J. Industry's idea clinic. Part 1: Industrial waste automatic sampling. Journal of the Water Pollution Control Federation, 37(4):508-534, Apr. 1965.

The selection of the proper methods and equipment for automatic sampling of industrial wastes is complicated by the lack of standard methods and a necessity for the development of specialized methods. The complexity of the problem is evidenced by the inclusion of 33 pictures and sketches of various sampling devices and their use in practice. The Industry Idea Clinic, held at the annual Conference of the Water Pollution Control Federation in 1964, provided a dialogue among the public agencies and the equipment manufacturers to compare specialized developments on industrial waste automatic sampling. The format involved a brief discussion of an experience or idea, followed by open discussion and questions from the floor. The sampling equipment discussed included everything from a beer can on a stick to a sophisticated automatic refrigerated, self-contained unit which provides a composite sample by collection of a fixed volume throughout a variable cycle. The importance of the flowmeter in any automatic sampling system is emphasized and the attention of the designer is called to such innovations as plastic flume liners, and instream actuation of the secondary meter. The objectives of sampling of industrial wastes are to assist in pollution control and to aid in the control of both waste treatment facilities and the manufacturing process from which the waste is derived.

65-0473
Lutin, P. A., J. J. Chibulka, and G. W. Malaney. Oxidation of selected carcinogenic compounds by activated sludge. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.131-145.

The efficiency of activated sludge treatment in removing carcinogenic hydrocarbons from waste water by the oxidative mechanism was studied using activated sludges from the municipal plant at Nashville, Tennessee; from the municipal plant at Franklin, Tennessee; and from the Ashland City, Tennessee plant. The Nashville plant handles an average of 54.0 MGD of an agglomerate municipal waste and is a conventional activated sewage unit. The Franklin plant handles 0.70 MGD of domestic sewage and laundry waste and employs aeration. The Ashland City plant handles 0.10 mgd of domestic sewage with no industrial wastes and employs extended aeration (aerobic digestion). The compounds have all be demonstrated to be carcinogenic to laboratory animals when ingested or contacted ectodermally. Incubation was at 20 C with constant motion for 144 hr. All chemical substrates were exposed to all sludges. Respiration of the sludge alone was measured and used as a control. Detailed results are given in 6 figures. None of the carcinogens were significantly oxidized by any of the activated sludges. The possibility that a substrate concentration of 500 mg per liter was toxic to the sludge microflora in a suspended solids concentration of 2,500 mg per liter lead to a further series of runs with a few of the carcinogens at a suspended solids concentration of 5,000 mg per liter. Benzyl alcohol was included as a positive control. Doubling the bacterial population produced no change in the oxidative patterns of the carcinogens. Apparently the threat of finding carcinogens in waste waters is not eliminated by the possibility of sludge oxidation.

65-0474
McCoy, J. H. Sewage pollution of rivers, estuaries and beaches. Public Health Inspector, 74(2):79-86, Nov. 1965.

Hazards arising from the disposal of crude sewage and sewage effluent to natural waters are the creation of nuisances and the transmission of infectious diseases. The continuous discharge of such sewage into a body of water in excess of the water's capacity for self-purification results in grossly polluted water. In studies conducted over the period of 1 year, the day-to-day median count of Escherichia coli varied in inverse ratio to the volume of effluent. Salmonellae infection from consumption of sewage polluted water tends to remain in the community longer due to individuals who excrete the organisms into the sewage and ultimately into their water, causing the reinfection of themselves and others. When sewage is discharged into a moving waterway, purification is greatest the first 2 miles of the river. In estuaries, fecal organisms survive only for a short period of time due to the chemical content of the water. Disposal into the open sea results in pollution of the area around the place of discharge, but the sewage is quickly dispersed by winds, currents, and tides. Seafood taken from an area which is polluted can lead to typhoid infection. The conclusions drawn are supported by data from actual experimentation. Methods which will reduce the chances of infection are: (1) screening of sewage; (2) maceration of the sewage; (3) relocation of the sewage outfall pipe; (4) removal of solids; and (5) full treatment of sewage.

65-0475
McKinley, J. B. Wet air oxidation process. Water Works and Wastes Engineering, 2(9):97-99, Sept. 1965.

Wet air oxidation is a method of burning organic matter dissolved or suspended in water, without high degree dewatering and incineration. It produces a small volume of inert ash suspended in a sterile, supernatant liquid without fly ash and soot. The Wheeling, West Virginia Sanitary Board selected this method for sludge handling and disposal. To 1965, the plant had processed 5.4 million gal of sludge 1,610 tons dry solid) at an operating cost of $19.97 per ton of solids, averaging 90 percent inorganic solid removal. Total time for system start-up is 4 hr; shutdown may be temporary, up to 24 hr, or complete, requiring 4 hr. Routine maintenance, indicated by temperature and pressure drops, consists of washing the system and occasionally changing valve trim. The unit operates only 10 days of the expected 20 days per month, since the oxidation plant is run above the design rate. Other results are found in included tables. The cost of the installed unit was $284,000. Future expectations of cheaper prices for chemicals and start-up fuel plus more frequent and longer processing runs are forecasted to reduce costs to about $17.00 per ton. The entire operation at the water pollution control plant is portrayed in two diagrams. The first one shows the processes occurring before the sludge is oxidized; the other shows the processes occurring during and after oxidation.

65-0476
McWhirter, J. R. Fundamental aspects of surface aerator performance and design. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.75-92.

Methods for determining the oxygenation capacity of aeration equipment include: (1) unsteady-state aeration of pure tap water; (2) the steady-state oxidation of sodium sulfite solution; (3) steady-state aeration of activated sludge systems, and (4) the unsteady-state aeration of activated sludge. These are all discussed, formulas given for the theoretical basis of each, and a new method (steady-state aeration of pure tap water) presented. In testing aerators it has been found extremely difficult to prevent a concentration gradient from developing in the liquid at the start of the aeration. This can result in the calculation of a mass transfer coefficient which is low by 10 to 20 percent. A steady-state reaeration technique was devised to give a further independent check of oxygenation capacity in pure water. This technique gave results about 10 percent higher than those obtained with the unsteady-state technique and in good agreement with the estimated error in the unsteady-state results. Sulphite oxidation data can only be interpreted by taking into account the effect of the rapid sulphite-oxygen reaction on the overall mass transfer rate. The simultaneous gas absorption plus reaction process can result in a significantly higher total mass transfer rate than the corresponding pure physical gas absorption process. Sulphite oxidation data in general show higher oxygen uptake rates than corresponding steady-state reaeration data. They also show a different temperature variation and a significant variation in oxygen uptake rate with different catalysts. Determination of quantitative design data or evaluation of aerator performance in an operating treatment system can best be done by detailed analysis of the mass transfer relationships.

65-0477
Magnus, M. N. History of fly ash collection at the South Charleston plant Union Carbide Corporation - Chemicals Division. Journal of the Air Pollution Control Association, 15(4):149-154, Apr. 1965.

A summary is presented of the installation and operation of fly ash collection and disposal equipment for coal fired boilers with a capacity of 1,900 tons of coal and 328,000 lb of fly ash a day. Tables are given which show the capital investment, the precipitator replacement costs per lb of steam generated, electrostatic precipitator performance data, operating costs, repair and maintenance costs, a summary of typical installation costs, fly ash collection summary, and fly ash analysis. The fly ash released to the air is 36,850 lb per day. Ash in the coal (12%) amounts to 456,000 lb per day. The cost of fly ash collection and disposal equipment was $900,000 with a replacement value of $1,640,000. The operating and maintenance costs are $78,800 per year. Fly ash from two of the boilers is removed by means of a vacuum pneumatic and bin storage system which contains primary and secondary receivers, a steam ejector, spray condenser, and a storage silo with a bag-vent filter. Fly ash from all of the other precipitators is sluiced to low areas around the plant for reclamation of unusable land. One tract, worthless because of flooding, has been filled to a depth of 20 ft and 12 acres of the filled land now used as a recreation area is worth $370,000 as undeveloped land. There is a need for greater latitude in precipitator design as it pertains to gas flow rates. In 6 of 8 installations, apparent gas flows were above the precipitator design conditions and the efficiencies were unsatisfactory. Changes in coal characteristics have a direct effect on precipitator efficiencies. Extensive cost, performance, operation and technical data on electrostatic precipitators is presented.

65-0478
Manufacturer cuts waste cost 42% with stationary compactor. Refuse Removal Journal, 8(8):32, 58, 60, Aug. 1965.

The Owens-Corning Fiberglass Corp.'s plant at Santa Clara, California, installed a stationary compactor, which has cut scrap hauling and disposal costs 42 percent. The compactor consists of a steel plate box, one end of which is a ram powered by a hydraulic cylinder. The ram compacts by driving the refuse into a trailer connected to the open end of the compactor. The trailer, designed to carry 18 tons, also has a hydraulic pump, which unloads the refuse at a landfill.

65-0479
Mattoni, R. H., H. N. Myrick, and E. C. Keller. Application of industrial photosynthesis process to waste water renovation systems. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series 118. p.684-705.

In 1964, North American Aviation, Inc. constructed and has since operated three experimental pilot-scale photosynthetic reactors in Lancaster, California, to define the potential uses of the industrial photosynthesis process. The applicability of the process to waste water renovations systems was studied. Water, suitable for use in irrigation industrial processes, etc. and biomass, which may be used for animal feed, carbon input for industrial process, etc. can be reclaimed from the industrial photosynthesis process. 'Industrial photosynthesis' refers to the process of growing a complex population of micro-organisms, predominantly unicellular algae, under control. The growth media are complex liquid organic substrates, such as primary or secondary waste water effluents. A photosynthetic system is selected when any thin film of aqueous organic medium is exposed to high light intensities. The three experimental photosynthetic reactors tested are oval-shaped, cement-lined structures with a sump and dam on their left sides. The productivity of the three reactors was measured by both the algal cell density and the packed cell volume. Growth rate parameters are given for the three growth phases and the population composition for the 3 reactors are shown in graphs. The extensive amount of variation observed for the reactor growth averages was a direct result of the extensive amount of divergence between the average cell densities of the three reactors; pH changes, and the temporal and absolute relationship between the levels of total alkalinity and pH are shown in graphs. For the pH levels obtained there was no apparent change in the relative species frequency profiles. Both bacterial and algal species in the three reactors were identical. The data showed that the conditions of the reactors select against both total bacterial population and specifically against the coliform component.

65-0480
Matusky, F. E., J. P. Lawler, T. P. Quirk, et al. Preliminary process design and treatability studies of fish processing wastes. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.60-74.

A plant has been designed for the treatment of wastes from fish and chip processing and domestic sewage. The major problem was to determine the effect of the fish wastes on the combined treatment system. A study of an existing fish plant was made as well as a laboratory digestion study of combined fish, potato, and municipal waste. Production methods were observed at the plant and compared to the proposed fish processing layout. Waste samples were collected at various points in the present plant and BOD, COD, suspended solids, oxygen transfer coefficient, and pH determinations made. The pH ranged from 6.5 to 7.5 and no difficulties in treatment was anticipated because of pH. Grease content varies with the kind of fish processed; cod and haddock have a grease content about 0.3 percent by weight while fat fish like halibut or herring have a grease content about 6 percent by weight. A high grease content inhibits oxygen transfer in an aerated biological waste stabilization system. Treatment-plant design loadings were computed for 1969 fish production estimates of 40,000 ton per year raw fish, 3,000 lb per hr potato sticks and a town population of 4,000. Complete treatment of the anticipated waste includes removal of coarse solids, oil removal, conversion of dissolved solids into sludge, sludge separation and disposal, and final effluent sterilization and disposal. A flow diagram for the proposed plant is given. The digestor experiments indicated that a mixed waste of fish, potatoes and sewage sludge can be digested at loadings of 0.1 to 0.36 lb VS/CF. At higher loadings digestion efficiency decreases as indicated by a marked drop in gas production per unit of volatile material destroyed and souring of the digestor becomes possible. The digestability of lean fish, fat fish, and fish oil were almost identical and no difficulties are expected from production schedules that segregate the type of fish. Other experiments were carried out and results are reported.

65-0481

Mercer, W. A., W. W. Rose, and E. S. Doyle. Physical and chemical characterization of the fresh water intake, separate in-plant waste streams and composite waste flows originating in a cannery processing peaches and tomatoes. Cannery Wastes Research Report No. 1. Washington, National Canners Association, Mar. 1965. 213 p.

Data acquired in determining the physical and chemical characteristics of the fresh water intake, separate in-plant waste streams and composite waste flows originating in a cannery processing peaches and tomatoes is given in 77 tables, 50 figures. A diagram of the plant, showing locations of the meters, is included along with a description of the meter itself and pertinent factors affecting results. The physical and chemical characteristics of water samples taken over a period of time for separate and combined peach and tomato operations are given and the analytical procedures followed described. The purpose of these investigations was to characterize strong and weak waste to make possible separate treatment or disposal of a smaller volume of liquid containing most of the organic waste load otherwise diluted in the total waste flow. The sampling procedures followed are outlined and photographs of various plant operations are included.

65-0482

Middlebrooks, E. J., A. J. Panagiotou, and H. K. Williford. Sludge accumulation in municipal sewage lagoons. Water and Sewage Works, 112(2):63-68, Feb. 1965.

Field data were collected from sludge samples at 15 lagoons of varying age and size in Mississippi, which treat municipal raw sewage and industrial wastes, to develop a rough guide for evaluation of rate of sludge accumulation. A minimum of 18 samples were collected in each lagoon with consideration given to direction of prevailing winds. Sludge and soil depths were recorded and the sludge portions of the samples were composited for analysis. The details of construction of the clear plastic sampling tube used are shown by diagram. Pertinent data about surface area acres, age at sampling date, BOD, loading, percent total solids and percent volatile solids of composited sample, and average sludge depth in inches of selected lagoons are tabulated. Depth of sludge in inches for the sampling lines parallel and perpendicular to the prevailing winds is listed by table for each lagoon, showing that where a sampling line culminates in a corner of a lagoon, there is a greater accumulation of sludge in the corners. Depth of sludge near inlet points along the sampling lines parallel and perpendicular to the prevailing winds are given by table, showing sludge concentrations at all inlet points. The rate of sludge accumulation as observed in the investigated lagoons is described in terms of a regression equation based on the parameters of age of lagoon, applied BOD loading rates, and average percent of total and volatile solids. The largest source of variation, 70 percent is explained by the age factor. The interaction between total and volatile solids is the second largest source of variation in terms of effect on sludge depth. Extrapolation of the equation indicates that the rate of sludge accumulation is 1 ft per 27.6 years.

65-0483
New sawmill chooses Bijoli baler. Waste Trade World, 106(3):12, Jan. 16, 1965.

The problem of disposing of 50 to 60 tons of chippings and sawdust from a new sawmill at King's Lynn in the most economical manner was solved by the use of a Bijoli baling press. The wood waste is controlled, conveyed, and collected by three installations. In the box wood mill, the waste from a 7-in. molder, a surfacer, a tenoner, and various cross-cut saws are exhausted through a 10-ft diameter cyclone by a 16,500 cfm capacity fan. The planing and saw mill with two 12-in. planers, 4 molding machines, two 54-in. band resaws, and a 36-in. circular saw are exhausted through a 14-ft cyclone by two fans with a capacity of 36,500 cfm. Discharge pipes from the roof cyclones provide a constant feed to the baler with a provision for diversion of excess to adjacent bins during peak production. The waste in the storage bins can be conveyed pneumatically back to the baler when required. The installation operates as an integrated unit in the production plan and handles the waste from the point of generation until the baled waste is ready for shipment to outside contractors who purchase the material. Prior to the installation of the baler, the transportation of the waste in bulk form was expensive and untidy. The two fans used on the planing and sawing mill are employed to give an optimum economy. The fan discharges are fitted with counterbalanced dampers to prevent dust from entering the plant.

65-0484
Niemitz, W. The heating value of sludges and its relationship to other sludge data. Wasser und Abwasser, 106(50):1392-1395, Dec. 1965.

Two types of heating values must be distinguished, upper and lower, depending on the evaporation heat of the water feed in combustion. The upper heating value, BOD, and carbon and hydrogen contents of the solids of a number of sludges were determined and listed in a table, indicating the close relationship between the heating value of activated sludges and their loss on ashing. The values of fresh sludges with 1 g of loss on ashing are higher by about 10 percent due to the fact that they are composed of a greater amount of hydrogen-containing compounds. The lower heating values establish a better relationship to the loss on ashing in this case. No difference at all exists between the loss on ashing obtained between 500 and 800 C and the heating value (data are listed in a table). British scientists first tried to express this relationship in a mathematical formula. In Germany the Fair-Geyer equation is the best known. It assumes that the sludge is dehydrated with the aid of chemicals prior to incineration and takes account of the origin of the sludge, making the calculation rather complicated and inaccurate. An equation was established to derive the upper heating value from the loss on ashing: Y (upper heating value) = X (loss on ashing/500 C/in percent of solids) x 83.3 - 1089. (Text-German)

65-0485
Niemitz, W., and K. Fuss. The specific filter resistance and the compressibility of sewer sludges. Wasser und Abwasser, 106(28):778-783, July 1965.

Specific filter resistance is based on the filtering velocity of a sludge under defined conditions. An equation for calculating specific filter resistance r of a sludge is given, the equipment for its experimental determination is illustrated, and r is determined for 31 different sludges, divided into four groups. The mean values for r calculated from the experimental data, are given along with maximum and minimum values. No major difference exists in the dehydration ability between fresh and activated sludges. Chemical substances in the sludges cause neither a noticeable deterioration nor a clear improvement of r; however, considerable influences into both directions are possible. Extensive thickening of the sludge makes a more economic dehydration possible, but no definite correlation was found between these two values or between r and the thickening ability. Sludges with a low loss on ashing generally also have a low r. The lower r is, the more attention must be paid to maintaining sludge structure. Since r is a function of pressure, the compressibility of sludge can be derived. The degree of improvement of r by adding flocculants is important for the dehydration behavior of sludges. (Text-German)

65-0486
1964 Meeting of the Association for Water Pollution Control. Wasser und Abwasser, 106(18):501-503, May 1965.

The Association for Water Pollution Control held its 1964 meeting on September 23 and 25, at Ebingen, Germany. Among the many papers presented, which dealt mainly with water pollution problems, one treated the common elimination of sewage sludge and waste. Two methods allow for a combined treatment of waste and sludge, namely, incineration and composting. The greatest reduction of volume is achieved through incineration. The annual amount of sludge is reduced from 550 liters per year to 10 liters per year, of waste from 700 liters per year to 60 liters per year. For comparison, about 200 liters per year remain from composting. Prior to composting, the sludge must be dehydrated to a water content of 50 percent. The water content also plays a role in the incineration. If the waste has a water content of 35 percent, an incineration without additives is still possible even when the fresh sludge has a solids content of only 11.5 percent and the activated sludge 13.5 percent. The incineration of sludge and waste can be carried out either in the conventional incinerator or in a rotating furnace. In any case the sludge must be dehydrated to some extent prior to incineration to achieve satisfactory results. (Text-German)

65-0487
Nusbaum, I., and L. Burtman. The determination of floatable matter in waste discharges. Journal of the Water Pollution Control Federation, 37(4):577-583, Apr. 1965.

An apparatus was developed which can be used to provide a standard test and establish criteria for floatable matter in wastes, especially those discharged through ocean outfalls. A sketch is given of the polyethylene drum, 13 in. in diameter and 24 in. high, which would contain 12 gal of sample. Small plastic couplings used to remove the upper layer of the sample were 3¼ in. in diameter and 3 7/8 in. high. In tests, the drum was filled to the 21 in. mark and the coupling was lowered into the device until the rim just touched the water surface. After 60 minutes a smooth plastic ball slightly larger than the coupling was slid under the surface to seal the coupling. The glass-fiber filter paper method was used to determine the filtrable solids before and after settling and a wet extraction method was used to determine the grease and oil. Two tables are given showing the floatable matter as filtrable solids and grease before and after settling at the San Diego Sewage Plant and at other plants in the vicinity. The information already obtained shows a considerable accumulation in primary and secondary effluents of filtrable solids and solvent extractable materials in the surface layers. San Diego primary effluent shows a geometric mean of 89 mg per liter before settling and 145 mg per liter at the surface after settling for one hour. Additional testing is indicated before the apparatus is fully accepted.

65-0488
Orderly and controlled deposition of industrial waste. Staedtehygiene, 16(12):272-275, Dec. 1965.

A group of German institutes concerned with the question of solid and liquid waste disposal jointly issued a pamphlet on the controlled dumping of solid waste in landfills. It is of utmost importance to prevent water soluble harmful substances from reaching the groundwater. This is done by selecting a proper landfill site, by sealing the ground with a layer of clay, packed soil or plastic material, and to some extent by sorting the waste according to harmfulness and water retention. Glasses, ceramics, soil and building debris pose no problems. Other waste is usually deposited in layers which are 1.5 m thick. To reduce water seepage, packing to increase the density, is advisable. Thin intermediate layers of soil, gravel, slag or debris prevent the wind from carrying away light material and provide a surface for motor vehicles. Inorganic water soluble waste is covered by layers of organic material with high water retention capacity. Dumping sites must be well-planned and managed. Flooded gravel pits must not be used as landfill sites since they are connected to the groundwater system. Swamps, although they seem to be isolated from the groundwater, may subside, thereby reaching the water table. Abandoned quarries and ground depressions must be checked for leaks. Landfills, when properly covered by a layer of soil 0.3 m thick, can be cultivated. They may also be used as recreational areas. For reforestation, only trees with a shallow root system are suitable because deep roots might penetrate the water-damming layers and cause seepage into the ground water. (Text-German)

65-0489
Paper and paper wastes - an operations analysis. Public Works, 96(10):146, 148, Oct. 1965.

An article, 'Studies in Force Main Aeration', by James E. Laughlin in Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers, December 1964, is reviewed. By 1963, the waste treatment facilities of the Covington Mill of the West Virginia Pulp and Paper Co. were handling over 50,000 lb per day of BOD--an increase of about 30,000 lb per day over the 1955 load. Although the treatment plant has not been enlarged, high efficiency has been maintained. The primary clarifier suspended solids removal, with inclusion of additional mill flows and the addition of a primary clarifier, is about the same. An improvement is noted in primary BOD removal efficiency. The effect of aeration detention time and mixed liquor solids on BOD removal during bio-oxidation treatment can be expressed by a suitable relationship. The rate co-efficient is influenced by variations in waste characteristics, temperature, and nutrient level. At temperatures greater than 100 F, the BOD removal efficiency is impaired. The effect of nitrogen deficiency on BOD removal is greatest at the highest temperatures. Increasing the nitrogen feed above 4.5 lb N per 100 lb BOD removed, exerts only a slight influence on BOD removal.

65-0490
Pfeffer, J. T., A. A. Samra, and D. T. Schwegler. Trace metals and filamentous micro-organism growth. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.608-617.

A sample of raw sewage from the Lawrence, Kansas, sewage treatment works was aerated by shaking with a New Brunswick scientific Model G10 Gyrotory Shaker at 200 cycles per minute. A synthetic substrate (details of its constituents are given in a figure) was fed to the flasks daily. About 30 minutes were allowed for solids separation after which 2/3 of the flask volume was wasted. This was replaced by the substrate. To encourage growth of fungi over bacteria individual trace metals were eliminated from separate flasks. The growth of the fungi on a specific substrate was measured. Six trace metals were investigated: iron, manganese, zinc, cobalt, copper, and molybdenum. Of the fungi studied, only iron and zinc were of significance to the organism's growth. Copper inhibited the growth of all cultures on the media employed. The trace metal requirements for filamentous fungi are different from those of bacteria. When the trace metal required for bacterial growth is missing, fungi will predominate and sludge bulking will occur. Good fungal growth was obtained in glucose with only iron or zinc present. These were the only trace metals of significance to fungi, except for copper which retards growth particularly on lucose. (The effect of copper on the acetate media was not as great as for glucose.) The chemical environment is important in controlling the availability of trace metals; ferric iron is extremely insoluble in natural waters and waters high in phosphates. Ferrous iron is more soluble. Zinc is reasonably soluble in natural waters, but not in the presence of high concentrations of phosphate.

65-0491
Pfeiffer, B. V. H. R. Zablatsky, J. B. Hazen, et al. Industry's idea clinic. Part II: Disposal of industrial waste treatment plant sludge. Journal of the Water Pollution Control Federation, 37(4):535-563, Apr. 1965.

The treatment methods developed for industrial wastes in one industry may not be applied in another or the advantages of treating industrial wastes and their accompanying solids with domestic sewage may not be recognized. The Industry Idea Clinic at the Annual Conference of the Water Pollution Control Federation in 1964 gave the representatives of industry and public agencies an opportunity to exchange information of mutual benefit on technical problems. The format involved a brief discussion of an experience or idea. followed by open discussion and questions from the floor. One table shows typical data of BOD and suspended solids by industry. The average BOD from paper pulping was 2,789 mg per liter and BOD from an industrial community was 360, compared to a residential community with 129. The highest average and the highest values for suspended solids were from waste stock and coating in the paper industry with values of 1,791 mg per liter for the average and 6,320 for the highest result. There are two sketches of the effluents from a copper smelter; sketches showing the use of digested and activated sludge for chemical waste degradation; and a diagram of a two-stage long-term lagoon. Tables and charts given include: effects of centrifuging sludge; the properties of digested and activated sludge; and reduction of solvents and degradation of toxic organic chemicals by digested sludge. The report to the Idea Clinic includes a state-of-the-art.

65-0492
Pipes, W. O. Carnivorous plants in activated sludge. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.647-656.

Samples of activated sludge from the experimental pilot plant at the Sanitary Engineering Research Laboratory, University of California, Berkeley (capacity of aeration tank: 600 gal and aeration time: 6 hr) were examined for predatory fungi. The carnivorous fungi found in activated sludge prey either on nematodes or rotifers: thus, the way to find these fungi is to look for dead nematodes and rotifers, and, when one is found, to examine it closely to see if it is attached to a fungal hypha or if there are hypae inside it. The hyphae of predatory fungi are more slender than those of some other fungi, but they are large enough to be easily distinguished from filamentous bacteria. A dead nematode may contain predatory fungus not readily apparent and therefore a sludge containing large numbers of dead nematodes should be examined by the enrichment technique. Two enrichment techniques were used: one consisted of placing a fairly large sample of activated sludge on a medium which would encourage the growth of rotifers and nematodes; the other consisted of placing a small sample of sludge in a dense culture of either rotifers or nematodes. The fungi recovered are described in detail and illustrated in figures. One fungus was somewhat similar to Zoophagus insidians Sommerstorff but is designated as Zoophagus sp. Results of the sludge volume index determinations on the fill-and-draw cultures of Arthrobotrys are given in a table. When the fungus was grown saprophytically on sewage with bacteria and protozoa, it formed a compact, readily settleable sludge. When large numbers of nematodes were added, the mycelium development of the fungus became more extensive and the sludge volume index increased. The media for enrichment cultures of predatory fungi are given in an appendix.

65-0493
Poloncsik, S., R. B. Grieves, and W. O. Pipes. Process optima in activated sludge. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.197-209.

The effects upon the activated sludge process of: (1) baffling the aeration tank to provide three completely mixed compartments of varying fractional volumes; (2) varying the input distribution of the waste to the three compartments; and (3) varying the recycle flow to the three compartments were studied. Two-phase and one-phase kinetics were used. (The latter for the no sludge recycle.) Figures are given of a schematic diagram of an activated sludge model, of the effect of volume distribution using two-phase kinetics, and the effect of input distribution using two-phase kinetics. The performance equations for these examples are developed. The results are limited by: (1) the volume apportionment of the aeration tank is only an approximation of the existing hydraulic regime (but it is a better estimate than the completely-mixed or the plug-flow model); and (2) concentrations of limiting nutrient and of active sludge mass do not necessarily correspond to the outlet BOD or suspended solids concentrations. In most instances the outlet five-day BOD and suspended solids can be obtained by simple conversion factors for the particular system. Optimum operation is achieved by dividing the aeration tank volume into three equal compartments. No baffling produces the poorest efficiency. The feed should be distributed toward the front of the system and avoid the third compartment if possible. If distribution is varied between the first two compartments only slight differences are produced. Step aeration should be avoided unless oxygen supply becomes the rate limiting factor. For an equal volume and feed distribution, the recycle should be inserted toward the back end of the system.

65-0494
Poston, H. W. A close look at a recent federal enforcement conference. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.1-5.

The conference was called by the Secretary of the Department of Health, Education, and Welfare and involved the Calumet River System and the southern end of Lake Michigan. The conference was complex in that it involved the second largest city in the United States, the largest water treatment plant in the world, the drinking water and recreational facilities for 4.5 million people. There were 15 points of agreement which will form the basis for abatement and enforcement. The recommended quality criteria goals for lake water at Chicago intakes are given in terms of acceptable limits on an annual average basis and permissible limits during not more than 12 days per year. The parameters include: coliform per 100 ml, annual limits less than 200 but 2,500 acceptable during not more than 12 days a year; dissolved oxygen, ppm, not less than 8 and not less than 5, respectively; BOD, ppm, less than 1.5 and maximum 3, respectively; and pH, average 8.2 and maximum 9, respectively. The responsibilities of the various governmental units to implement the recommendations are described.

65-0495
Proceedings; Conference on Waste Disposal for Food Processing Plants, Easton, Md. Jan. 12, 1965. University of Maryland and U.S. Department of Agriculture, Mar. 1965.

This conference on waste disposal for food processing plants was sponsored by the Cooperative Extension Service, the University of Maryland, the Mid-Atlantic Food Processors' Association, and the Maryland Department of Water Resources. The meeting exemplified the importance of waste disposal to the food industry. Members of the Cooperative Extension Service along with the Regulatory Agencies and Industry discussed the many aspects of the problem of waste disposal and means by which the problem could be solved for the betterment of all concerned. The methods available for the disposal of solid waste and liquid waste were discussed. To produce the industry's annual, nationwide pack of 750 million cases of canned foods required about 36 billion gal of water. The method commonly used for treating domestic sewage, to secure a high degree of purification, involves biological oxidation by one of several different procedures. Whether enough water is being used or not, there is always room for water conservation in most plants, due to actual waste and inefficient use. Although there are no completely satisfactory and cost-free ways to deal with the canning waste solids problem, the present methods are considered. For waste disposal with sprinkler irrigation systems the first information of concern is the amount of waste effluent for which an acceptable system is necessary. The final design should be prepared by a reliable irrigation equipment dealer who would recommend the best adapted models of equipment and control systems.

65-0496
Purcell, L. T. Raw sludge disposal by vacuum filtration. Water Works and Wastes Engineering, 2(9):64-65, Sept. 1965.

The raw sewage-sludge dewatering facility, in Butler-Bloomingdale, New Jersey, has resulted in: (1) economical operation; (2) elimination of severe odors; and (3) improvement of the community's attitude toward the plant. The plant handles raw primary settling tank and secondary solids from 15,000 persons, and operates a Komline-Sanderson coilfilter 3 days a week with average loadings of 7 lb per sq ft per hr. It also pumps raw primary sludge to conditioning and dewatering equipment, and produces and disposes of sludge cake. Numerous facilities had been added to the existing plant with proposed improvements based on a projected population of 15,000 with an average flow of 1.5 mgd. Existing digestors had been the greatest problem. Vacuum filtration was thus added to eliminate sludge digestion and sludge drying on sand beds. A coilfilter was installed and existing digestors were converted to sludge holding tanks. All sludge is drawn from primary settling tanks and discharged either to the holding tank or directly to the process; chemical conditioning of raw sludge takes place; dried filter cake is transported and disposed of in the abandoned sand drying bed area. During a normal 6 hr filter run, periodical sludge pH and cake production checks are made. Shut down and cleaning of filter requires 7 hr; general maintenance occurs one day each month when acid baths may be given. Filter cake is sent four times a day to disposal areas which are covered at the end of the week.

65-0497
Purdue University. School of Civil Engineering. Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. 803 p.

The 20th Industrial Waste Conference was sponsored by Purdue University in conjunction with the Indiana State Board of Health. Sixty-six papers were presented. The subjects included: federal enforcement, fungi in sludge digestors, low pressure wet air oxidation of sewage sludge, fish processing wastes, surface aerator performance, a field countercurrent extractor for water pollutants, carbon as a parameter in bacterial systems growth, ion flotation, trickling filter, agricultural ammonia for digesters, photosynthesis, activated sludge, biodegradability, coliform, aerobic bacteria, pesticides, pollution control for mining, benthos and plankton, sludge bulking, the effects of high salt concentrations and of nitrogen and phosphorus on sludge, lagooning, radioactive waste disposal, liquid-solids separation, oxygen transfer, dewatering, culture studies of bacteria, trace metals, duck wastes, acid mine drainage, sewage chlorination, spray irrigation, algae, polyelectrolyte coagulants, and LAS and ABS treatability.

65-0498
Quon, J. E., and G. B. Ward. Convective drying of sewage sludge. International Journal of Air and Water Pollution, 9(5):311-322, May 1965.

Because of the success of sludge drying beds with only limited drainage, it is desirable to know more about the mechanisms of sludge dewatering. In this work, a study was made of the rate of sludge drying by convection as a function of the temperature, humidity, and velocity of the air over the sludge surface. A schematic drawing is given of the experimental arrangement for the determination of sludge drying rates effected by convection. Tables are given which show: sludge characteristics; reduction in sludge moisture with time; a summary of sludge drying rates and the operating variables of temperature, relative humidity, and air flow; and the heat and mass transfer coefficients. Graphs are given which show the weight remaining versus time, the drying rate versus the moisture content, the drying rate versus the temperature difference, and the drying rate versus the humidity difference. For an air flow of 9 ft per second, a temperature of 83 F and a relative humidity of 52 percent, the sludge drying rate was 0.092 lb per hr-sq ft compared to an evaporation rate from a free water evaporation rate of 0.21 lb per hr-sq ft for humidity differences greater than 0.03 lb moisture per lb of dry air. The values were not particularly sensitive to sludge depth nor to variations in the temperature, humidity, or air flow over the ranges studied. The high value of ration of heat transfer coefficient to the mass transfer coefficient suggests that the plane of vaporization is below the physical sludge surface.

65-0499
Quon, J. E., and T. A. Tamblyn. Intensity of radiation rate of sludge drying. Journal of the Sanitary Engineering Division, American Society of Civil Engineers, 91(SA2):17-31, Apr. 1965.

Field experience has indicated that drying time required by the conventionally designed and operated sludge drying beds is comparable to that required by beds modified to provide only limited drainage and cleaned with mechanical equipment. Quantitative information on the dewatering characteristics of digested sludge is provided and is useful for the design of drying beds with limited drainage. The rate of water evaporated from a sludge surface and a free-water surface, as a function of the radiant intensity incident on the sludge surface, was found to be essentially equal when evaporation was the sole mechanism of dewatering. For an intensity of 1.00 calorie per sq cm per minute, the evaporation rate was 0.9X per .001 per g per sq cm per minute. The evaporation rate from the sludge surface was depressed by 22 percent when both evaporation and drainage contributed to the dewatering. One-half of the energy incident on the sludge surface was found to be associated with the latent heat of vaporization. The emissivity was found to be dependent on the wave-length of adiation. The critical moisture for the sludge used ranged from 66 percent to 84 percent.

65-0500

Rabb, A. Sludge disposal: a growing problem. Hydrocarbon Processing, 44(4):149-150, Apr. 1965.

An investigation in the Netherlands showed that amount of sludge depends on the quantity of waste water treated, degree of contamination and required effluent quality. To minimize treating unit costs, contaminated water storage is provided. For a 40,000 to 50,000 bpsd refinery, treatment rates range from 200 to 900 U.S. gpm. A table shows ranges of impurities. Solids settling in the oil separator, chemicals, and microorganisms must be removed. Preparation of the sludge for burning is basically water content reduction. Highest practical concentration is reached by filters. Rotary kilns can operate with five to 70 percent solids; with 40 to 70 percent, a stationary incinerator can be used. Electric power cost $0.0125 per kwh; fuel oil, $15 per ton; labor, $8,000 per man-year based on five years of operation. Graphs show costs and concentrations. Optimum concentration of sludge before burning is shown as a function of the lean sludge quantity. Small equipment has a relatively high cost.

65-0501

Renn, C. E. Woodbridge, Virginia, field tests of biodegradable LAS detergents in extended aeration activated sludge systems. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.734-737.

Field tests were conducted to emphasize conclusions previously reached about the behavior of degradable detergents that may be useful in the operation, treatment, and design of new plants when LAS base materials come into general use. Influent ABS concentrations were found to vary widely (7.5 ppm to 32 ppm); effluents ranged from 2.5 ppm to 13.0 ppm. All residents shifted to degradable LAS materials at the same time and a rapid decline in foam on the surface of the aerator was noted. Effluent samples showed declining foam levels and the concentrations of methylene blue active equivalent (to determine residual anionic detergents) declined from 8 ppm to 3 ppm. High excess oxygen in the effluent could no longer be maintained and the aeration interval times in the cavitator had to be increased. The BOD removal efficiency declined steadily. Difficulties in maintaining dissolved oxygen arose from the change in the character of the air-water emulsion generated with LAS-bearing waste feed. When the old ABS sludge was pumped out and the system started fresh, there was a rise in BOD removal efficiencies and a declining ABS-free effluent. The efficiency of detergent removal was found to be modified by overall BOD removal efficiency, but a system operating in the range of 80 to 90 percent BOD removal could be expected to degrade 80 to 90 percent of the LAS. Neither BOD removal nor LAS removal was affected adversely by low temperatures. Loads of LAS detergent were added to the waste stream; average influent levels were first brought to 25 ppm, then to 50 ppm, and finally to 75 ppm LAS. The first two increments were successfully assimilated, but when essentially 225 ppm was added, the solids became too thick to obtain effective settling.

65-0502

Rickard, M. D., and W. H. Riley. Carbon as a parameter in bacterial systems growth limitation and substrate utilization studies. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.98-109.

The utility of carbon analysis in following the metabolism of organic compounds during the growth of a bacterial culture in a defined medium is surveyed. The relationships obtained among cellular carbon, exogenous soluble carbon, and viable count during bacterial growth are shown along with the rates of synthesis of cellular material. The method is based on the rapid combustion of a micro sample in oxygen and measurement of the carbon dioxide produced with a nondispersive infrared analyzer. Aerobacter aerogene. ATCC No. 8308 was used. Graphs show: the calibration curve for carbonaceous analyzer, the linearity of carbon determination on A. aerogenes, the growth rate of A. aerogenes in glucose, the variation in the carbon content of viable cells, and the carbon balance on the respiration of A. aerogenes on glucose. Although the viable count data show the existence of a lag in cell division during the first two hr of incubation, the cell carbon analysis showed no lag in the synthesis of cellular material. The carbon content of the cells varied significantly as a function of the culture age. The well-established lag in cell division without a corresponding lag in development of cell mass that occurs when organisms from a stationary phase culture are inoculated in fresh medium means that organisms in the stationary phase have lost the biochemical systems necessary for cell division and that a definite time lag phase is required for the reestablishment of these systems. Oxygen was an important factor in the development of maximum populations in the non-substrate-limited systems.

65-0503

Riley, W. H., and M. D. Rickard. The biochemical aspects of aerobic bacterial growth. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.235-247.

A physiological and biochemical description of Aerobacter aerogenes growing in liquid culture is reported. The inoculation of these cells from a stationary phase culture into fresh medium starts a chain of biochemical events that result in a differentiation from a resting cell to a dividing cell that has increased its mass, DNA, RNA, and protein content. This differentiation process is respondible for the delay in cell division seen after inoculation. The delay has not been completely explained. Sub-cultures into fresh medium from an experimental culture show that lag phase is dependent primarily on the age of the culture. Dilution during the lag phase does not lengthen the lag period. Cell division begins at the same time as in the parent culture. Dilution of samples from the lag phase is not followed by the onset of a lag period. Sub-cultures taken during a period of arithmetic growth do, however, have a lag period. The environment is changed by increases in mass and in population so that it can longer support a logarithmic increase in cellular material. At this time, by some as-yet-unknown mechanism, the cell stops logarithmic growth and enters a period of selective synthesis. RNA synthesis stops completely and protein synthesis stops temporarily. The period of arithmetic growth that follows represents the continued increase in cellular material necessary to return to the biochemical composition of the resting phase cell. The sanitary engineer would like to find a method of prolonging the period of logarithmic growth. It is possible that an inoculum of logarithmically growing cells might be useful in activated sludge systems.

65-0504

Robert A. Taft Sanitary Engineering Center. Interaction of heavy metals and biological sewage treatment processes. Cincinnati, U.S. Department of Health, Education, and Welfare, May 1965. 201 p.

This volume, a collection of 10 research papers originating at the Robert A. Taft Sanitary Engineering Center, describes the effects of chromium, copper, nickel, and zinc on sewage treatment processes. Results of pilot plant studies and full-scale municipal plants are given. For each of the metals and combinations of metals studied, the effects on the aerobic and anaerobic treatment processes, under continuous dosage, are given. The data presented allow a reasonable estimate to be made of the amount of metallic wastes that a treatment plant can receive and accomplish the desired efficiency of treatment. The effects of slug discharges of the metals on the aerobic and anaerobic processes under pilot plant conditions and at municipal plants are presented. The concentrations of the metals in the various sludges and effluents produced by a treatment plant are given. Metal balances conducted for each of the studies show the amount of metal removed by primary and secondary treatment. The report includes explanatory figures and tables.

65-0505

Rock, R. M., and N. C. Burbank. Modifications to the Briggs micro-electrophoretic cell and comparisons with the Zeta-Meter cell. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.589-607.

Micro-electrophoresis may be used to evaluate the treatment of industrial waters and wastes, but detailed information on equipment has been lacking. Four types are in use. However, the purpose of present study was to study the original Briggs design, improve it in any way to increase the speed of determinations and the versatility of applications and to compare it to the patented, manufactured cell known as the Zeta-Meter. The original design of Briggs is shown in a figure and the alterations introduced shown in four figures. Certain disadvantages of these modifications are pointed out. The Zeta-Meter cell is described and illustrated. The two units were compared in terms of: size and handling, availability and cost, optics, stationary levels and counting planes, timing charts, and accuracy. The two units were found to be comparable with respect to size, speed of determinations, size of the smallest colloid visible, and the values of determinations reported on identical colloid systems. The Zeta-Meter was found to be more rugged, compact, and portable. The Briggs cell was less costly, better adapted to the determination of dense colloid populations and to possess a wider range of available optics. The Zeta-Meter cell was found to be better adapted to determinations of fast settling colloids than the horizontally oriented Briggs cell, but less effective than the vertically oriented Briggs cell. For high conductive media the horizontally oriented Briggs cell was found to be better adapted than the Zeta-Meter. The two units together have a capability for handling a wide variety of industrial water and waste coagulation problems.

65-0506

Seidel, H. Solids handling and disposal. Water Works and Wastes Engineering, 2(9):63, Sept. 1965.

None of the solutions to the solids handling problem seem particularly attractive. Anaerobic digestion of sludge is a time-tried process which returns valuable dividends such as combustible gas and organic humus. Whether it pays to lime the digestor is the argument. Wet sludge presents drying and transportation problems. Mechanical dewatering solves a few problems, but runs the cost upwards. Burning of sludge involves the digestion question again. New high-pressure, high-temperature incineration systems along with atomizers, fluidizers, polymerizers, and devitamizers are the present-day solution. Solids handling is one of the most interesting, frustrating, rewarding, costly and productive challenges that man faces.

65-0507

Sheahan, J. P. Use of styrofoam for trickling filter covers. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.572-582.

A method has been developed for enclosing space with a technique called 'spiral generation' which can form singly or doubly curved structures of rigid plastic foam. These structures may be used as covers over trickling filters to eliminate such problems as freezing or acceptable appearance. Experiments were carried out at the Waste Water Treatment Plant, Midland, Michigan. The effect of the cover on the temperature of the air over the filter was studied in Jan. to March 1965. It was found that the air temperature inside the covered dome was maintained at about the same temperature as the influent. The outside temperature was as low as zero a number of times. BOD removal was not essentially changed for the covered filter when compared with the uncovered filter during cold weather. Covers for trickling filters cannot be solely justified because of increased efficiency. Covers do prevent freezing of the unit and, in Northern climates, may begin to justify the use of covers. The covers were found not to eliminate odors, since ventilation is required, but they will contain the odor release it at a higher elevation and provide the basis for odor control with an ozone generator. Fog was controlled with the cover. The covers provide a physical barrier to the spread of filter flies. Two photographs illustrate the aesthetic values of the covers. The disadvantages are impaired air movement, lack of sunlight, and cost. The average comparative costs of various types of construction (precast, pour in place, steel, form liner, spiral generation form, wood, space frame, spiral generation structure) are given. They range from $5.00 per sq ft for precast down to $2.75 per sq ft for spiral generation structure.

65-0508

Sherbeck, J. M. Synthetic organic flocculants used for sludge conditioning. Journal of the Water Pollution Control Federation 37(8):1180-1183, Aug. 1965.

The Bay City Sewage Treatment Works is a primary plant treating seven mgd of sewage and removing 1.2 tons daily of dry solids. Conditioned sludge flows to one of two vacuum filters. Conditioning chemicals are added as the sludge enters the mix tank. Data compares results of operation using synthetic organic flocculants with using ferric chloride and lime as conditioning chemicals. There was an approximate increase of 40 percent dry solids production over the years during which ferric chloride and lime were used. Chemical costs are reported in a table. Trials with different synthetic organic flocculants have reduced the chemical cost from $14.50 to $7.00 per ton of dry solids processed. Benefits derived from the conversion to polymers include: equipment savings, less floor space, improved housekeeping, improved safety, reduced bulk of ash, large reduction in ash handling and storage, and reduced operating time.

65-0509

Silvester, D. K. The anaerobic digestion of slaughterhouse waste. Institution of Public Health Engineers, 64(pt. 2): 100-109, Apr. 1965.

This paper concerns the problems involved in the initial stages of the operation of an anaerobic digestion plant for slaughterhouse waste and the modifications which were found necessary by operating experience. The plant capacity was 970 hog units a day, the equivalent flow was 37,000 gal per day, the BOD load was 1,180 lb per day, and the BOD strength was 3,190 ppm. All heavily polluted liquors, other than blood (which was treated separately in the coagulating plant), were passed through a comminutor to shred sheep paunches and other large pieces of organic material and then to an agitated balancing tank. From there it went to the heated digester with the effluent being removed diametrically opposite the inlet. Following passage through the degassing chamber, the effluent entered the sedimentation tank before passing to an existing conventional plant with filter and humus tank. The solids built up excessively in the digester, requiring modifications. The comminutor at the inlet was replaced by mechanically raked screens to protect the pumps from odd sheep's feet. The fine screening to remove hair and vegetable debris is carried out over the balancing tank. Several tables are given of the results which the author describes as encouraging. The agitation has been increased in both the balancing and digestion tanks to prevent quiescent zones at the bottom of the tanks. The plant has finally been able to produce a burnable gas. Future developments will be reported.

65-0510

Smith, L. L., R. H. Kramer, and J. C. MacLeod. Effects of pulpwood fibers on fathead minnows and walleye fingerlings. Journal of the Water Pollution Control Federation 37(1):130-140, Jan. 1965.

The influence of short exposures to four types of wood fibers on the mortality rate and sublethal physiological responses with fathead minnows (Pimephales promelas) and walleye fingerlings (Stizostedion vitreum vitreum) was studied. Nine tables are given which include a summary of the bioassay experiments, fish survival data, hematocrit data, the effect of tricaine methanesulfonate on the hematocrit and amount of blood collected, and the significance of fiber treatment in reducing time to death at lethal temperature. The effect of suspended wood fibers on mortality of fish depends on the species of fish, type of wood fiber, processing method, oxygen concentration, and, to a lesser degree, water temperature. Conifer groundwood was the most lethal fiber. Groundwood pulps were more lethal than chemical pulps. There are significant changes in the blood of fish exposed to wood fibers. Increased hematocrit values resulted from increased concentrations of all groundwood fibers when dissolved oxygen was at saturation.

65-0511

Smith, P. H. Pure culture studies of **methanogenic** bacteria. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6 1965. Purdue University Engineering Extension Series No. 118. p.583-588.

Materials and methods for the isolation and study of methanogenic bacteria from domestic sewage sludge are described. The medium is given in terms of its final percentage composition The medium was boiled to drive off dissolved oxygen and the atmosphere above the medium was maintained free of oxygen by flushing with a gas mixture of 70 percent hydrogen and 30 percent carbon dioxide. The dilution technique, the subculture technique, modification of the method (to solve the problem of culturing the bacteria by excluding oxygen), substrate utilization and tests for purity are briefly summarized. These pure culture studies are difficult because of the extreme sensitivity of the organisms to molecular oxygen. However, these organisms can be isolated in pure culture if techniques are used which adequately control the oxygen tension at every step in the procedure.

65-0512

Sohr, W. H., R. Ott. and O. E. Albertson. Fluidized sewage sludge combustion. Water Works and Waste Engineering, 2(9):90-93 Sept. 1965.

The East Cliff-Capitola, California, sewage treatment plant is designed to process primary organic solids up to an ultimate flow of 8 mgd, with equipment to handle 550 lb per hr dewatered sludge. Raw sewage enters the plant through a 4-in. pipe and a force main, is shredded, and enters a clarifier where solids which settle to the bottom are collected and removed. The overflow enters a chlorine-contact tank where flow is measured, chlorine is added, and the effluent is carried out into the Bay of Monterey via an outfall line. All solids collected from the settling basin are pumped to a cyclone grit separator where noncombustible materials are removed, and the remaining sludge is fed into a thickener. Sludge then goes into a high speed centrifuge where it is dewatered enough to burn itself completely to ash in the FluoSolids reactor. Gases emitted are cleaned in a liquid scrubber and emerge as a plume of water vapor. A small cyclone removes the ash, and it is periodically disposed of by landfill. This Dorr-Oliver FS Disposal System is a new concept in reduction of sewage solids by combustion. It can be operated by one trained individual; operating costs consist of diesel fuel, electricity, sand, and lubricating oils. This plant meets all standards set by California's air pollution code and presents no problem to surrounding residents.

65-0513

Stein, J. Three years of experiments in dehydrating sludges with the aid of precoat filters in the purification plant, Weidenau-Geisweid, Germany. Wasser und Abwasser, 106(50):1396-1401, Dec. 1965.

In the purification plant, Weidenau-Geisweid, Germany, experiments in dehydrating sludges were conducted with Heymann and precoat filters. A fluid free of solid particles was achieved with the precoat filter but not with the Heymann filter. Fifteen experiments were performed with the precoat filter. One determined the influence of drum revolutions on filter capacity, dehydration effect, and operating costs. Capacity increased with the number of revolutions; however, water content increased too. Operating costs did not change. Yield in solid particles was 100 percent. Filtrate was clear, but the biochemical oxygen demand was still 100 to 120 mg per liter. The experiment was made with activated sludge; wood dust was used as additive (peat dust proved to be too capillary), but a mixture of peat and wood dust gave slightly better results. When using ash as additive, it is advantageous to mix it with dust from grinding wood to avoid clogging of the filter tissue. Adding flocculents increased filter capacity by more than 100 percent; when fresh treated sludge was used capacity was increased by only 25 to 30 percent. Tables give results of dehydration and show the influence of dehydration on filter dimension and sludge incineration. A much larger filter surface is required for dehydrating fresh sludge than for activated sludge. (Text German)

65-0514

Stephenson, J. W. Developments in small scale sewage disposal. Public Health Inspector 73(4):197-205, Jan. 1965.

Some brief observations on selected items of interest to public health inspectors who operate small-scale sewage disposal works are presented. Many improvements have been made. Their advantages are listed: (1) fibreglass prefabricated septic tanks with high impact resistance have been developed which can easily be handled by two men; (2) consolidation of small town sewage systems means that only one central plant would be needed for several communities who would pump sewage to it; (3) comminutors make the task of cleaning screens and disposal of screenings unnecessary; (4) automatic desludging valves for settling tanks lessen the problem of sludge removal; (5) mechanical sludge removal device will extract solids from any type of sewage; (6) filter media produce better effluents; (7) mechanical filter distributor features a slow-moving distributor with a heavy discharge which is preferable to a faster moving distributor with slim jets; (8) humus tanks work better on a 6-hr basis rather than a 4-hr basis; (9) extended aeration seems to be best suited to the small works; and (10) portable automatic sampling machines eliminate the time required for individual sampling. Other topics discussed were improved sludge removal and disposal methods, recirculation of effluents, and final purification of effluent. Local authorities must be prepared for future modifications to ensure greater efficiency of operation and purification.

65-0515

Stross, R. G., F. M. Unger, J. C. Jones, et al. Utilization of algae by Daphnia as influenced by cell senescence and UV irradiation. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.706-714.

The thoracic appendages of Daphnia can collect particles ranging in size from 0.9 to 18,000 cu microns from large volumes of water. The rate of ingestion may be in direct proportion to the volume of particles collected by the appendages. The utilization of senescent cells of algae was measured and the effect of senescent and UV-irradiated algae on the intrinsic rates of increase of Daphnia populations was evaluated. The methods and materials are described. When Daphnia were fed suspensions of Chlamydomanas the rate of cell removal declined with the age of the culture. The filtering rates of adult Daphnia pulex feeding on cells of C. reinhardi from cultures of 10, 16 and 26 days old are shown in a graph. Washed cells from older cultures inhibited ingestion, although washing seemed to remove much of the inhibition. Centrifuged suspensions of cells from the various aged cultures are described. The inference that age of Chlamydomanas cultures influences food intake was supported by growth rates of Daphnia populations. The only population statistic which failed to show the influence of senescent food was the death rate. The inhibitory effect of senescent food was stimulated by exposure of log-phase cell suspensions to UV irradiation. Irradiation of food reduced the rate of increase of the Daphnia from the 0.28 per day observed in controls, to 0.16 per day in populations feeding on cells given 25,000 ergs per sq mm. Larger doses (75,000 ergs per sq mm) resulted in only slightly greater inhibition Associated with irradiation were detectable quantities of lipid peroxides in the cells of Chlamydomonas. Thus, it was found that ingestion of Chlamydomonas cells by Daphnia is reduced progressively as the food cultures age. The feeding of senescent cells of Chlamydomonas reduced the intrinsic rate of population increase to nearly one-third that in the control populations. A hypothetical population was constructed to show the influence of algal senescence on density and permissible washout rate of Daphnia population in equilibrium with its food supply

65-0516

Synthetic textile industry. Public Health Service Publication No. 1320. Washington U.S. Government Printing Office, 1965. 23 p.

The methods of evaluating the industry's waste load discharge and its effect on the stream and ways to reduce this load in the most economical manner are suggested. A textile finishing mill requires from five to 15 or more gal of water per lb of fabric, depending on the complexity of the finishing process. The various operations performed on the synthetic fibres in converting them into a finished fabric are outlined and a flow diagram for a mill of this type are offered. Dyestuffs, depending on the fibre involved, may range from ordinary acid dyes through acetate and basic colors to special types. The liquid waste discharge will vary from about eight to 15 times the weight of the fibre dyes. In determining disposal methods for wastes from the manufacture of synthetic fibre textiles, the first approach should always be a study of in-plant methods and chemicals. More rigid processing controls may lead to less reprocessing and consequently lower waste loadings. High BOD chemicals might be replaced with lower BOD chemicals. Excessively hot wastes should be sent through a heat exchanger before being discharged into a stream. Toxic materials must be watched; some will not be removed by, nor interfere with, a treatment plant but will go through it into the receiving streams. Many plants will need some degree of treatment. Several methods are presented, ranging from lagoons to highly complex systems providing maximum possible treatment.

65-0517

Teletzke, G. H. Low pressure wet air oxidation of sewage sludge. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.40-48.

The objective of the Zimpro sludge treatment is to produce a sterile, nonputrescible solid residue, unidentifiable as to origin, easily concentrated to the minimum volume consistent with the lowest total cost. Sewage sludge is heated with air to an initiating reaction temperature between 300 and 400 F, then enters a reactor where the desired oxidation and a further temperature increase takes place. The degree of oxidation depends on temperature pressure, holding time, and concentration of the sludge received. Operating pressures may be 150 to over 3 000 psi. If the process is not thermally self-sustaining steam may be injected to sustain the reaction temperature. Heat in the oxidized products is recovered by heat exchange with the entering sludge and air and the gaseous effluent separated from the liquid carrying the solids. The exhaust gases may be scrubbed and discharged to the air or where economic conditions make it attractive, may be expanded in a power recovery unit to recover the energy. The solids may be separated from the carrying liquid and concentrated by settling sand bed drainage, vacuum filtration, or centrifugation. A flow sheet is shown. Depending on the degree of oxidation a wide range of end products is possible. The drained residue is sterile and unobjectionable after as little as 10 percent COD reduction. The relative costs versus COD reduction are shown in a figure. The method is economical, flexible, and produces a sterile and acceptable end product. The unit should prove applicable for the majority of installations in the United States.

65-0518

Valente, G. A. A new idea in sludge dewatering. American City. 80(7):95-97, July 1965.

After almost 3 years of operating experience with a prototype sludge-dewatering machine that operates on unconventional but simple principles, the City of Caldwell, New Jersey, plans to incorporate this mechanical sludge-dewatering system in its plant expansion program. It will not only eliminate the need for sludge drying beds, but also do away with certain digester operating problems. The dewatering unit consists basically of two cells formed by a fine-mesh nylon filter cloth that travels continuously over front and rear guide wheels. A drive roll and sproket assembly act as a separator between the cells. Dewatering occurs in the first cell and cake formation takes place in the second. A set of center guide wheels divides the cells into compartments. This division reduces the span of the filter cloth across the cells. A flow sheet and photograph of the unit is provided. The operation of the unit is also described in detail. Tests, to determine what chemicals could be added to aid filtration and create optimum coagulation, demonstrated conclusively that the polyelectrolytes were most effective in coagulating digested sewage sludge. Total weekly volume of digested sludge dewatered averaged 8,000 to 10,000 gal. In comparison, sludge withdrawals onto the drying beds have averaged 10,000 gal per week for about 32 week per year, since very little sludge could be placed on the drying beds during the winter months The dewatered stabilized sludge cake, which is discharged directly into a truck, averages 85 percent moisture. No serious maintenance or operating problems have been experienced with the unit.

65-0519

Varma, M. M., and R. S. Talbot. Reaction rates of photosynthesis. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6 1965. Purdue University Engineering Extension Series No. 118. p.146-174.

The main source of oxygen in a sewage lagoon is from the end-product of photosynthesis by algae. A smaller amount, up to about 40 lb of oxygen per acre per day is provided by absorption at the air-water interface aided by wind action. Carbon dioxide, inorganic salts, water and energy of the sun are used by algae to produce protoplasm with oxygen and water released into the surrounding medium. Since no photosynthesis occurs at night, stabilization ponds tend to become depleted of oxygen by the biological demand of bacteria and other heterotrophic microorganisms and by the algae themselves. Septic conditions sometimes result. Artificial illumination may alleviate this but continuous artificial light may be detrimental to oxygen production. Since the rate of photosynthesis is affected by: (1) intensity of light, (2) pH, (3) temperature, and (4) age of the culture, variations in these may be useful in control. The effect of changes in these factors on the rate of photosynthesis of Chlamydomonas has been studied. It was found that the rate of photosynthesis increased with temperature at a given pH and light intensity. Under given conditions, there is optimum light intensity at which the rate of photosynthesis is maximum. Intensity of light is more critical at 25 C than at 30 C. Varying other factors in experiments is needed to establish the effect of temperature on the rate of photosynthesis.

65-0520

Viraraghavan, T. Digesting sludge by aeration Water Works and Wastes Engineering, 2(9):86-89. Sept. 1965.

Laboratory work was undertaken to determine the suitability of sludge for aerobic digestion under normal climatic conditions prevailing at Madras, India. Sludge samples were taken from a source which receives mainly domestic sewage. Four series of experiments involving aerobic digestion of sludge for periods of 5, 10, 15, and 20 days were performed. Raw and digested sludge analyses were carried out in accordance with the procedure in 'Standard Methods for the Examination of Water and Wastewater' (APHA) with modifications. These were carried out in July and August with a temperature range of 35 to 27 C with the average being 31 C. The conclusions reached were: (1) A fairly high degree of digestion of raw sewage was obtained under aerobic conditions; (2) Aerobically digested sludge had no disagreeable or objectionable odor, (3) Reduction in volatile solids depended upon detention time. After 15 days, the reduction was not significant; (4) Nitrification of sludge occurred during aerobic digestion; (5) There was significant reduction in supernatant BOD during aerobic digestion; and (6) Data generally indicated that 15 days detention was optimum for the stabilization of sludge under the normal climatic conditions at Madras.

65-0521

Walker J. F., and J. H. Dougherty. Use of polyelectrolyte coagulants to enhance settling characteristics of activated sludge. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6 1965. Purdue University Engineering Extension Series No. 118. p.715-723.

A total of 12 different polyelectrolyte coagulants were studied. The overall effects of polyelectrolytes on the BOD reaction and the oxygen utilization rate of activated sludge mixed liquor was examined. The effects of varying concentrations of polyelectrolyte on the biochemical oxidation rate were compared to that of a control. The data indicate significant suppression of the BOD reaction rate with certain of the polyelectrolyte materials studied. Settling batch studies were made by observation of the height of the sludge layer versus time as the sludge in a quiescent sample of mixed liquor is permitted to settle. Further studies were performed on a continuous flow basis utilizing textile waste waters as the source of food. After only 24 hr of a cationic type of polyelectrolyte coagulant, BOD removal efficiencies increased from 68 to approximately 85 percent, mixed liquor suspended solids concentrations increased from approximately 1,000 ppm to almost 1,300 ppm and the periodic system failures previously experienced did not occur. No one type of polyelectrolyte was found to be universally effective in increasing the agglomeration and settling rate of activated sludge The settling test performed in a one-liter graduated cylinder using a stirring mechanism was found to be an effective analytical tool in the choice of a coagulant aid.

65-0522
Wallace A. T., G. A. Rohlich and J. R. Villemonte. The effect of inlet conditions on oil-water separators at Sohio's Toledo refinery. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p 618-625.

Two oil-water separators were studied. These separators are part of a bank of ten parallel basins, each receiving feed from a common channel. Oil-water enters an individual basin through three 18 by 18 in. slide gates operated by hand valves located on the walkway over the inlet end of the separators. The effluent leaves over simple weirs at the end of each separator and is conveyed away in a common channel. Each basin is 80 by 18 ft in plan and has a water depth of 7 ft 8 in Basin No. 1 has a simple overflow weir inlet and Basin No. 2 has an inlet consisting of four 10-in. reaction-jets, baffles 11 in. in diameter with a 3-in. hole in the center. The basin and inlet details are shown in figures. The experimental method was to obtain dispersion curves for both basins at comparable flow rates and to measure the removal of oil at the same time. Basin No. 2 with the reaction jet baffle inlet appeared superior to the simple overflow weir inlet. The testing period was brief so it would be desirable to get more data on comparative oil removals. Comparison between the measured oil removals and the removals expected if 'ideal flow' (the concept of Camp) is assumed showed that both separators are far from 'ideal' and that the relative efficiencies became less as the flow rate increased dropping from .81 to .59 for the reaction jet baffle and from .675 to .235 for the overflow as the overflow rate increased from 500 to 4,000 gal per sq ft per day.

65-0523
Walters, W. R., and G. Ettelt. Dewatering of the fly ash by-product from the wet oxidation process. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.551-571.

The Zimmerman wet air oxidation process (Zimpro) treats 15 to 18 percent of the sludge produced by the Chicago Sanitary District. The effluents from Zimpro are now lagooned, but it may become desirable to dewater and thicken the effluent before transportation to the ultimate disposal site. Sedimentation followed by sand bed drying does not seem to be economically feasible because of the restrictions of winter. This paper is concerned with two of the unit operations for solids-liquid separation: filtration and centrifugation. Most of the work is on filtration. The properties Zimpro slurry are reviewed. Bench scale filtration tests and pilot plant filtration experiments are described and illustrated by drawings and photographs. A simplified sketch of a concurrent solid bowl centrifuge is given and pilot plant studies together with results are reported in figures. Dewatering the Zimpro effluent is seen as but a preliminary step in the sludge disposal problem. The long-term goal is not merely disposal but use of the Zimpro effluent in ways that will substantially reduce costs.

65-0524
Waste from coal mine conveyed through mountain. Refuse Removal Journal, 8(8):42-43 Aug. 1965.

The Eastern Associated Coal Corp. has built a conveyor system for refuse disposal at its Kopperston, West Virginia, coal mining operation. The refuse consists of material mixed with the coal, such as shale and clay; the mine handles 6,000 tons of waste products and 12,500 tons of clean coal per day. Refuse from the preparation plant moves uphill by conveyor, travels through a mountain, is discharged into a silo, and then is dumped into a landfill.

65-0525
Wenzl, H. F. Evaporation and burning of sulfite spent liquors. Paper Trade Journal 149(23):59-63 June 7, 1965.

Technical problems, processes, and technology concerning evaporation and burning of sulfite spent liquors are reviewed with reference to the literature. Three operations required to recover heat from organic substances in sulfite spent liquor are: (1) separation of liquor from pulp with the least possible dilution; (2) evaporation of liquor to a concentration which sustains combustion; and (3) burning of concentrated liquor with as complete recovery as possible of heat from combustion gases. Several commercial processes available for evaporation, which is normally carried to a solids content of 55 percent, include multiple effect vacuum evaporation, back pressure evaporation, and evaporation by thermal compression. Tables give a comparison of heat consumption and fuel savings for different evaporation systems, and a survey of fuel and power consumption for a sulfite pulp mill, with and without alcohol production, for paper and for dissolving pulps utilizing various methods of evaporation. The three evaporation systems are also compared by means of flow diagrams. The vacuum system and the counter pressure system can be combined with alcohol stripping to reduce the size of the plant and increase safety of operation. Another table gives data which shows that sulfur losses in the condensate, in the waste stream of the six-effect evaporator and in the waste gas, increase with increasing temperature and decreasing pH of the liquor. The combustion of the concentrated spent liquor is discussed. Wet combustion (or flameless oxidation), where completely different considerations have led to spent liquor recovery, is discussed. Heat production from sulphite spent liquor in relation to dry content and evaporation system used is presented graphically.

65-0526

Wet oxidation of sewage sludge. Water and Waste Treatment Journal, 10(9):477-478, Sept.-Oct. 1965.

Summaries are given of a research paper on the wet oxidation of sewage sludge, a report on the operation of a wet oxidation plant in Westchester County, New York, and the regulations recently issued in Britain covering wet oxidation plants. In the research paper by Hurwitz, Teletzke, and Gitchel, the characteristics of various degrees of oxidation of a raw primary sludge, a digested primary-activated sludge and a concentrated raw activated sludge are discussed. Solids from low to high degrees of oxidation show qualities such as sterility, biological stability, settleability, and drainability, which make the end-products suitable for ultimate disposal. An installation at Blind Brook in New York has a wet air oxidation process with a capacity of 1 ton per day which has been in operation for a year. In the wet air oxidation the oxygen in the air under greater than atmospheric pressure combines with the organic material in organic solution or suspension at temperatures below 372 C. At a treatment cost of $41 a ton, it was concluded that the wet oxidation process was an economical solution to sludge handling for small plants. Circulars issued by the Ministry of Housing and Local Government and the Secretary of State for Wales contain technical data on aeration sludge plants including a description of the process, recommendations on sites, sewage flow, general requirements, and basic design criteria. The issuance on these bulletins appear to give approval for use of this type of equipment in Britain.

65-0527

Woodland R. G., M. C. Hall, and R. R. Russell. Process for disposal of chlorinated organic residues. Journal of the Air Pollution Control Association, 15(2):56-8, Feb. 1965.

A continuous process for the disposal of halogen-containing organic residues is described together with a schematic drawing and two photographs which show the decomposition of wastes to gaseous by-products by high temperature reactions with air and steam. The exit gases, essentially carbon dioxide, nitrogen, and hydrogen halides can be scrubbed with water to remove any atmospheric pollutant. The rate of residue generation of this type is estimated at over 1,000 tons a day in the United States. The residues are pumped from storage tanks to the reactor where a reaction with steam and air takes place at 900 to 1,400 C to convert the halogenated hydrocarbons to HCl and carbon dioxide. After cooling in a carbon block, direct contact cooler to 100 C, the gases are passed through a carbon block scrubber to remove the potential air contaminants such as HCl. After passing an entrainment separator, the remaining components (nitrogen, oxygen, water vapor, and carbon dioxide) are vented to the atmosphere. Organic S compounds would give sulphur dioxide in the exit gas. Tables are given of the chemical reactions involved, the operating conditions, and the residue composition. This process gives emission products such as HCL which are less obnoxious and easier to absorb than the chlorine which results from low temperature incineration. The approximate cost of a unit capable of disposing of 20 million lb per year of highly chlorinated residue has been estimated at $250,000. At the Hooker Chemical Corp. at Niagara Falls, the direct costs of reactor disposal are less than 50 percent of the direct costs for drum burial. This cheaper than conventional method (i.e. ground burial) also provides complete and permanent disposal.

65-0528

Woodley, R. A., and S. L. Moore. Pollution control for mining and processing of Indiana coal. In Proceedings; 20th Industrial Waste Conference, Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.265-274.

Coal mining is the leading mineral industry in Indiana. Pollution from surface mines, underground mines, and coal processing plants is being controlled by: flooding final surface mine excavations, diversion of run-off from active mine operations, rapid conveyance of precipitation and seepage waters from mining operations, disposal of acid-producing refuse in surface mine excavations, clarification of coal wash water in settling ponds, reuse of coal wash waters, and soil coverage of acid-producing refuse disposal sites and roads. The history of coal mining in Indiana is traced. As early as 1925, water pollution from mine drainage to lands by surface mining operations was observed. The various control measures adopted are reported. Graphs show: the annual coal production in Indiana the number of active coal mines in Indiana, the annual acreage disrupted and reclaimed and the stream mines affected by mine drainage. When a surface mine is opened all surface streams around the coal recovery area must be diverted. Diversion ditches should be utilized. Acid-producing material should be deposited in an excavation that will be covered with cast overburden during coal recovery. Generally, the underground mine drainage problem in Indiana is confirmed to disposal of seepage water from active workings. The disposal of acid-producing material from the processing plant is a major problem. Most pollution problems due to mine drainage in Indiana can be controlled. Adequate pollution control for acid sandstone overburden has not been established and research is needed

65-0529

Woods C. Determination of proteins in waste water. In Proceedings; 20th Industrial Waste Conference Lafayette, Ind., May 4-6, 1965. Purdue University Engineering Extension Series No. 118. p.501-515.

Three methods for the determination of proteins (Kjeldahl, Folin reaction, and Biuret reaction) are described in detail. Data for dilution factors of 25 to 200 on samples of digested anaerobic sludge taken from the El Paso Treatment Plant are given in figures. The variation in the results is more likely due to the actual variation in the samples than the dilution factor. The results are more accurate if the dilutions are such that the optical density falls between 0.4 and 1.8. Typical results of determinations of proteins by the three methods are tabulated. The wastes studied included: feed sludge, transfer sludge from first to second stage supernatant from second stage, and stabilized sludge from second stage, all from a two stage digestor operated by the City of Fort Worth, Texas; raw primary sludge, and digested sludge from another plant operated by the City of Forth Worth; slaughter house wastes from near El Paso. These data show a wide variation in numerical values of the protein concentrations for the three methods. None of the methods can be considered to give an 'absolute value' of protein concentration for each method has its limitations. The values gotten with the Kjeldahl technique are probably nearer the absolute value because of the tendency to have a low result due to the lower nitrogen content of conjugated proteins is offset by the fact that not all organic nitrogen is associated with protein.

65-0530

Zimpel, J. Elimination of waste water. VDI (Verein Deutscher Ingenieur) Zeitschrift, 107(14):645-647, May 1965.

Twenty-four articles and books published in 1963 to 1964 in the area of waste water technology are reviewed. Since October 1, 1964, the law prohibits the use of 'hard' detergents. Soft detergents are more easily decomposed by bacteria but are more poisonous to fish. The increased atrophy of many lakes necessitates a third cleaning stage for the waste water. There the phosphates and nitrates are either biologically bound by algae or chemically precipitated. Phosphates can be bound by aluminum, copper, iron or magnesium salts, nitrates by iron hydroxide. Digested sludge has only one third of the volume of non-digested sludge. Its elimination is therefore up to 77 percent less expensive. Natural drying of sludge is less expensive than artificial drying in vacuum filters. Large cities incinerate their sewage sludges. The least expensive (5.07 DM per cu m) method is the combination of centrifuge + vacuum filter + incineration. A new method is the wet oxidation of the Zimmermann process. More and more sewage plants are becoming automated, however, only cities with a population above 100,000 can afford the investments in automated measuring and control equipment. Smaller cities can participate in regional cooperative programs to supervise sewage treatment facilities. (Text-German)

HAZARDOUS WASTES (including Pesticides)

65-0531

Breidenbach, A. W. Pesticide residues in air and water. Archives of Environmental Health, 10:827-830, June 1965.

The level of contamination of surface water by a pesticide which will interfere with any of the industrial or domestic uses of water-is not generally known. Concentrations which might be deemed acceptable for one use would not be for another use. Contamination studies began in 1957 by the U.S. Public Health Service. Samples from rivers and lakes are obtained to identify the organic chemicals, using the carbon adsorption method. Since 1962, the aromatic fraction of the chloroform extract of these samples has been subjected to electron capture gas chromatography which supplemented an infrared analysis, and was later exposed to microcoulometric titration gas chromatography. The laboratory is currently able to detect several pesticides--DDT, DDE, Aldrin, and heptachlor included--and some organic phosphorus type pesticides. Pesticide data is entered into the STORET system of storage and retrieval by electronic data processing equipment. An accurate assessment of pesticide concentrations in ambient air cannot be made at this time. Techniques are currently being worked out to identify pesticides in the air, but data available is not sufficient to fully evaluate its quality to date.

65-0532

Kawahara, F. K. and A. W. Breidenbach. Pesticides and water quality-potentials for their removal. Columbus, Ohio, U.S. Public Health Service, 1965. Nov. 3, 1965. 10 p

An efficient sampling system for determining the presence of pesticides requires the passage of 250 gal of water on activated carbon at a flow rate of 100 ml per minute. One can confirm the presence of some pesticides by injecting aliquots into gas chromatographic equipment or by subjecting them to infrared spectrophometric examination. The second type of sample is basically a bottled sample, one liter in volume. The pesticides on the silica gel layers are removed. Analysis is accomplished with the electron capture and microcoulometric gas chromatographic equipment. The results of two studies in 1962 and 1964 indicate the presence of chlorinated hydrocarbon pesticides in rather low concentrations in surface waters. But fish are more sensitive than man and many have been killed. It was concluded that intermittent operation of carbon columns will reduce soluble organic material in clarified bio-oxidized waste effluents to levels below 1 mg per liter. Solubility of the particular pesticide in water plays an important role in its removal by coagulation and filtration through sand. DDT was easily removed this way. Using ozone and potassium permanganate did not decrease chlorinated hydrocarbons. Foaming of secondary effluent removed 35 percent of organic and 75 percent of synthetic contaminants. Single pass electro-dialysis reduced salt concentration by 45 percent. Oxidation may eliminate organic contaminants.

65-0533

Manual for decontamination and disposal of empty pesticide containers. Washington, National Agricultural Chemicals Association, June 1965. 20 p.

Pesticide containers are classified combustible, large non-combustible, and small non-combustible. Each of these containers should be disposed of as quickly as possible. Combustible containers can be completely destroyed by burning. If burning is not possible, the containers should be crushed and buried. Weed killer containers should not be burned. Small non combustible containers are of sizes up to the 5 gal size. They should not be reused for any purpose. The inside should be washed with water containing a detergent and caustic soda and the water buried. Glass and plastic containers should be completely mutilated and metal ones crushed. Burying in dumps is their method of disposal. Large non-combustible containers are 15 to 30, or 55 gal metal containers. These containers should be decontaminated by a professional drum reconditioner. If this is not possible, the container should be mutilated by puncturing and then burned. Some professional methods of decontamination are washing, heating, and sandblasting. Different methods of decontamination are used for different pesticides.

65-0534

Manual on waste disposal. Washington, National Agricultural Chemicals Association, June 1965. 44 p.

A special NACA-Industry committee issued a series of suggestions to be used as guidelines which might be followed in the disposal of waste from pesticide manufacturing and formulating operations. These guidelines are not intended to supercede any effective waste disposal practices now currently followed by individual plants. Most pesticides present problems in waste disposal. Among some of the items covered are: pollution control; waste prevention; general disposal methods; specific methods of waste treatment and disposal; burial method; incineration; deep well disposal; disposal at sea; disposal methods for chlorinated hydrocarbons, organic phosphates, and related materials; and disposal methods for carbamate pesticides, dithiocarbamates, phenoxy acids, salts and ester, botanicals and inorganic pesticides. Diagrams, charts, land layouts, and bibliographies are included.

65-0535

National Agricultural Chemicals Association. Disposal methods for chlorinated hydrocarbons. In Manual on waste disposal. Washington, June 1965. p.27-29.

Chlorinated hydrocarbon pesticides from a decontamination standpoint are divided into two groups: those decomposed by alkalies and those by an acid condition. The physical state of waste material from formulation production may be in several forms: solids (wettable powders dust concentrates, diluted dusts); liquids (oil solutions emulsifiable concentrates); and gaseous (true vapors, air dispersed mists). Solids may be disposed by removal and buried in a designated area; may be flushed down sewers if the system is equipped for the decontamination of toxic materials; may be placed in a permanent waste stock pile which meets all air and water pollution requirements; and may be sent to a solid settling pond if such hydrocarbon are de-toxified either before or after entering the pond. As to liquid disposal, the solutions must not be run into sewers, lagoons or placed on solid waste piles. It is recommended they be burned in an incinerator. As to gaseous disposal, the vapors or mists may be removed by suitable scrubbing towers and or activated carbon towers. Scrubbing liquids can be sent periodically to ponds for decontamination.

65-0536

National Agricultural Chemicals Association. Specific methods of waste treatment and disposal--burial. In Manual on waste disposal. Washington, June 1965. p.15-17.

Considerations given to the burial of solids and trash should be based on: sanitation requirements; availability of land; pollution potential to surface or ground water supplies; choice of the trench method or the area method; and operating a land fill as an engineering project. Burial should not be adopted for the disposal of waste unless: the landfill operation will not pollute water supply; the method is economical and does not lead to loss of materials which should be salvaged; the physical properties can be compressed; there is sufficient quantity to attain maximum economy; adequate land is available; the ultimate use of the land will benefit from the fill operation.

65-0537

National Agricultural Chemicals Association. Specific methods of waste treatment and disposal--incineration. In Manual on waste disposal. Washington, June 1965. p.17-23.

Prior to incineration the physical and chemical proportions of the wastes must be determined. Proper burning of waste liquid requires proper mixture of air and atomization of the liquid. Furnace and burner selection should be done with care. The selection of solid waste burners can also involve complex considerations. Some types of incinerators are: trench incinerator (used to destroy chemical wastes and containers), organic liquid waste burner (to handle waste solvent disposal), and chlorinated hydrocarbon disposal system (for tar and waste solvents). The disposal of chlorine-containing tars and waste solvents poses a particular problem to the pesticide manufacturer. Such tars and solvents cannot be buried in any significant amount and when burned in simple pits and furnaces, hydrogen chloride gas and smoke can cause air pollution. A residue (tar) disposal system is illustrated which, although expensive to buy and to operate, does provide a positive, safe means of burning such material.

65-0538

Weaver, L., C. Gurnerson, A. Breidenbach, et al. Chlorinated hydrocarbon pesticides in major U.S. river basins. Public Health Reports, 80(6):481-493, June 1965.

Extensive surveillance for chlorinated hydrocarbon pesticides as well as other synthetic organic pollutants has been underway by the U.S. Public Health Service for several years. Recent development of analytical procedures capable of measuring pesticides in the parts-per-trillion range on grab samples made it desirable to conduct a special synoptic survey of various U.S river systems during September, 1964. Two 1 quart grab samples were collected from each of 96 different sampling points. Three types of analytical procedures were employed: (1) liquid liquid extraction, (2) thin layer chromatography, and (3) microcoulometric titration gas chromatography. In order of frequency of occurrence, dieldrin, endrin, DDT, and DDE were found in all major river basins. Heptachlor and aldrin were less abundant. DDD was detected at only one sampling station; presumptive evidence of benzene hexachlorine was observed at only one station; and no indication of heptachlor epoxide was seen at any station. These three results may have been due to the lower sensitivity of the procedure for the three compounds. Generally, both the occurrences and concentrations found in grab samples from the synoptic survey were in accord with the results of previous analyses of samples obtained by the carbon absorption method.

SALVAGING

65-0539

Accent on technology. Waste Trade World. 106(18):13, 14, May 1, 1965.

Several displays at the International Trade Center of the London International Engineering Exhibition are described. The Hiab Speedloader, a versatile crane exhibited by the mechanical handling department of George Cohen Machinery Ltd., is available in a range of models and can be fitted to most types of lorries. Copies of an article, 'Cutting lorry loading costs' which was printed in Waste Trade World and which describes their use, were available. The Crane Weigher, perhaps suitable for merchants without weighbridge facilities, is described. It allows direct weight readings to be made at the time the metal is being lifted. A range of compact, box-girder designed cranes, characterized by high performance and low price, were displayed by Acrow Ltd. Two types, one all-electric in operation and offering spans up to 55 ft, are described. A range of electric hoists was shown and technical data, including load capacities, lifting heights, speeds, direction, control, etc., were supplied.

65-0540

Air Pollution Control Association. TI-5 Public Utilities Committee. Informative air pollution problems in fly ash sintering plant. Informative Report No. 6. Journal of the Air Pollution Control Association, 15(3):123-124, Mar. 1965.

In 1962, the fly ash collected from pulverized coal-fired boilers in the United States was 11 million tons, of which 400,000 tons were collected at Con Edison plants with a disposal cost of $1.50 a ton. The only known application that has potential for keeping abreast of production (25 million tons in 1980) is used as a lightweight aggregate for concrete when sintered at 2300 F after pelletizing into balls with a maximum diameter of 0.75 in. The Con Edison Astoria plant with a 1,010 ton per day capacity feeds the raw fly ash from storage to pelletizers and thence to the sintering grates. The sintered fly ash cake is broken up and conveyed to storage piles after screening to remove the fines. The chief difficulty appeared to be excessive dust formation. Lack of control on the sintering operation resulted in a drying, rather than sintering, of the pellets which resulted in the emission of clouds of dust. Proper control of the sintering operation eliminated this problem. It was found that the conveying of fly ash by open belts created dust, therefore open belts are being replaced by enclosed conveyors as rapidly as possible. In the interim, water sprays are being used at strategic points. In general, the dust problem arose at transfer points which were insufficiently exhausted. In two years the nuisance dust problems have been corrected and the installation is considered a success. It was anticipated that the combustion air pulled through the burning zone might have an excessive dust load, but it was found that no dust collector was needed. This report represents the 'best thinking' on the sintering of fly ash of the Air Pollution Control Association.

65-0541

Aluminum scrap recovery advanced with induction furnace. Industrial Heating, 32(7):1258, 1260. July 1965.

An aluminum scrap melting operation, which melts and recovers saw chips, scalpings, and other finely divided scrap, is described. A sixty cycle, 700-KW, 7 000 lb coreless induction melting furnace is used. Scrap from aluminum fabricating and rolling operations is separated by alloy and charged in batches. The electro-magnetic stirring action, inherent in an induction furnace, thoroughly mixes the metal and brings slag and other impurities to the top of the melt. Homogeneity of the melt prevents alloy segregation and keeps gases and inclusions to a minimum, resulting in the recovery of metal of excellent quality. Molten aluminum is poured into sows and subsequently remelted for rolling mill slabs. The furnace, which requires little floor space, can melt 3,000 to 3,100 lb of aluminum per hr. It is simple to operate and does not require skilled labor. Maintenance is minimal with lining life expected to exceed one year.

65-0542

Bender R. J. More intensive utilization of flyash. Power, 109(6):94 June 1965.

Mr. A. Jarrige, chief engineer of Mines of the North and Pas de Calais, France, whose company intends to build a plant designed to make light aggregate with sintered flyash pellets, spent over four weeks in the U.S. studying the development of flyash utilization. He feels that although flyash has many applications, it is difficult to convince people to use it. His visit culminated in a recent Power-sponsored conference in New York, where he reviewed his findings. From the discussion, six facts clearly emerged: (1) A great amount of research on the properties and potential uses of flyash is being carried out in the United States, although more coordinated effort is needed; (2) The valuable assets of flyash are known to those in research, but not enough is being done to pass the information along to those who could profit by it; (3) Efforts should be made to understand the effect of slight differences in the physical and chemical composition of flyash and to recommend appropriate ways of coping with them; (4) Although a substantial amount of flyash is used by those who produce it, little effort is made to facilitate its sale and transportation; (5) The use of portland cement, which in Europe contains 25 percent flyash, is being used at an increased rate for road construction in France, and various applications are spreading to other countries; and (6) a coordinating body in the United States would be very useful, sponsored by one of the electrical utilities since they are the major flyash producers.

65-0543

Bevan, R. E. Refuse analysis-recent tests in Manchester. Public Cleansing, 55(1):33-36, Jan. 1965.

Three tables, with no discussions or conclusions, reveal the economics of a separate waste paper collection and the refuse storage capacity required if it were practical to collect waste paper separately. One table contains an analysis of a load of household refuse not including a separate paper collection, and the third composites the first two. One hundred and ninety-eight homes were selected, but only 109 paper sacks of separate waste paper were collected. Seven hundred and eighteen lb of paper were collected separtely with 10 lb of contraries. Eight hundred and forty lb of the 2,720 lb of regular bin collection was unseparated waste paper.

65-0544

Big municipal collection drive in Scotland. Waste Trade World, 106(14):11, Apr. 3, 1965.

A £2,500,000 expansion of a plasterboard liner plant at Muglemoss, Aberdeen, Scotland, now being completed will not only furnish a needed product, but will double the present consumption of 900 to 1,000 tons per week of waste paper valued at £500,000 per year. The local municipal authorities in Scotland and North of England, who presently supply much of the waste paper, have indicated that they will make an effort to increase deliveries to meet the new demand which should net £1,000,000 in the next year. In Scotland the main sources of waste paper are the larger cities, such as Glasgow, which receives £100,000 a year for 1,000 tons per month of waste paper. Edinburgh furnishes 500 tons a month, Aberdeen 200 tons, and Dundee 60 tons. This new demand should stimulate municipal waste paper collection in Scotland.

65-0545
'Bricks' from shale. Waste Trade World, 107(17):11, Oct. 23, 1965.

A new process of producing lightweight aggregate building blocks from bituminous shale, clay or volatile ashes has been developed in Poland. Since the process makes use of waste material with some coal content, additional fuel is not required, which lowers the production costs. It is claimed that the Polish method is the cheapest method available. The concrete has better thermal insulation properties and the lowering of the per unit weight has not resulted in any lessening of its wear and tear qualities. Furthermore, the overall weight of a building which utilizes this concrete can be cut by 20 percent and the use of steel for reinforcement by 10 to 15 percent.

65-0546
C. C. Cooper install bulk-handling plant for scrap. Waste Trade World, 107(2):6, July 10, 1965.

A recently-installed bulk-handling plant for scrap with automatic bale conveyancing for the rapid loading of rail wagons is described. The plant, situated under a large gantry crane, is mounted on a raised platform with access by a concrete ramp. A baling press is positioned under the platform at the rear from which the finished material is conveyed directly to railway cars. At present throughput averages around 200 tons per week, but increased production is expected. The operation is fast, compact, and efficient, enabling the firm to handle large quantities of a bulky, comparatively lightweight commodity. Scrap intakes are derived mainly from works clearance and demolition contracts. Finding new outlets for processed scrap is the biggest problem facing all merchants, but the use of a modern and efficient transport system for scrap collection has enabled the firm to extend its sphere of operations. Other items of equipment at the yard include a Hyster 10-ton fork-lift truck, a Jones 4-ton crane, and scrap shears.

65-0547
Con Ed turns waste to wealth at fly ash sintering plant. Rock Products, 68(10):81-82, Oct. 1965.

The process and equipment used at the 1,000-tpd fly ash sintering plant at the Astoria (L.I., N.Y.) Generating Station of the Consolidated Edison Co., which converts fly ash into lightweight aggregates used in structural grade concrete, is described and illustrated. Fly ash collected by electrostatic precipitators is pelletized and conveyed to a sintering machine which uses a Dwight-Lloyd type of traveling grate. Carbon content of the raw fly ash from the Astoria Station usually ranges between 6 and 8 percent, with a minimum content of 4 percent. This provides enough combustible material for self-ignition when subjected to the ignition burner flame. Consumption of natural gas used for firing is about 1,200 cu ft per ton of sintered material. Operations are regulated from a central control console. The suppliers of major equipment used in the process are listed.

65-0548
'Dumpster' enters the scrap trade. Waste Trade World. 107(17):8, Oct. 23, 1965.

The Dempster-Dumpster containerized handling equipment made by Powell Duffryn Engineering Co. Ltd., of Cardiff, goes to work in the scrap iron and steel trade with significant benefits for both the operators and their clients. The big capacity Dempster-Dinosaur system is already widely used in the scrap iron and steel business but now a substantial order from Birmingham merchants N. Perks Ltd. marks the Dumpster's entry to the trade. Perks are being supplied with tilt type demountable containers of 6-cu yd capacity and Dumpster 303 C handling units mounted on Bedford KGT chassis. They chose the Dumpster instead of the Dinosaur because of the lighter system's ability to operate in small, congested scrapyards with narrow accesses and the handling unit's high maneuverability made possible by the short wheel-base chassis. The Dempster-Dumpster scrap handling container system is already in use by Perks and their new service is growing rapidly in the Birmingham area.

65-0549
Erythropel, H. Ash and slag.
Brennstoff-Waerme-Kraft, 17(4):191, Apr. 1965.

The enormous amounts of ash and slag produced by large, coal-heated, power stations pose a real utilization and disposal problem. Therefore all German, French, and British literature has been scanned and the articles pertaining to this problem have been listed. (Text German)

65-0550
Fussell, O. P. Selection and use of secondary fibers in cylinder board manufacturing. Paper Trade Journal, 149(49):78-81, Dec. 6, 1965.

The changing patterns of waste paper salvage are discussed. Control of contaminants and new methods of contaminant removal, including asphalt dispersion, cylinder board deinking, and plastics and wax removal, are described. Asphalt dispersion is a thermo-mechanical process which disperses asphalt, waxes, pitch, sizes, and wet strength resins to produce a sterile, deodorized product worth $15 per ton more than the raw materials, which consist mainly of old corrugated boxes and some cylinder board filler stock. Deinking, used on printed news as well as highest white grades, performs the functions of pulping, cooking, cleaning, screening, and bleaching. A cylinder board mill batch deinking system, which pulps raw materials at elevated temperatures of about 120 F, is described. The separation of polyethylene type plastics and fibers is an operation of extremely selective discharge pulping, followed by particle size screening. Most of the raw material is milk carton and cup stock. Heavily waxed stock goes mostly to export markets where wax salvage is a factor along with the need for secondary fiber. Molded pulp products are an outlet for lightly waxed waste, which is decreasing in supply. The asphalt dispersion, deinking, and plastics removal systems are presented in flowsheets. The problems between waste paper dealers and the mills are discussed.

65-0551
Goodeve, C. F. Research on scrap. Waste Trade World, 107(7):7-9, Aug. 14, 1965.

Since scrap iron is an important source of raw material for the expanding British steel industry, experiments were conducted to improve its conversion to steel. By 1966 open-hearth production is expected to decrease to less than two-thirds of the total while the new oxygen steelmaking processes, LD, LD-AC, Kaldo and Rotor should exceed a quarter. Since the increasing cost of electricity is a major concern, a half-ton electric arc furnace was converted to an oxy-fuel steelmaking unit by replacing the three electrodes with a single central burner and by installing a waste gas extraction system to give the benefit of a water-cooled damper to control furnace pressure. It was established that rimming, carbon and low alloy steels could be made with good control of carbon and sulfur to within normal specifications. The same results were obtained with larger plants. The fuel oxygen scrap process also has the advantage of lending itself to fumeless refining. To improve charging techniques, it is important to increase bulk density in the charging boxes. Density experiments showed that the charging box should be as large as possible and that hydraulic shearing offers the most attractive way of increasing scrap density. Mechanical charging devices are in the process of development.

65-0552
Goodeve, C. F. Research on scrap - part II. Waste Trade World, 107(8):6-8, Aug. 21, 1965.

Mechanical charging devices for steel plant furnaces are reviewed. The only known rapid charging system for open-hearth furnaces is described. The basis of the system, which has already charged 85,000 tons of material into a 200-ton tilting furnace, is a wheeled scrap bin hauled by a Tugmaster tractor. This technique, plus the experimental use of oxy-fuel roof burners, has shortened tap-to-tap times by about one-third, with considerable reduction in fuel consumption. The capacity of 5 larger bins, now under construction, will be 27,000 cu ft to allow 125 tons of cold material to be charged and scrap consumption to be increased. Calderon chargers for oxygen converters and open-hearth furnaces consist of a wide gauge railway carriage on which is mounted an 'orientating' chute and a mechanism for tilting the large container of scrap. Twenty-two tons of scrap can be charged into a 75-ton vessel in a few minutes. The system has also been adapted for charging scrap to fixed open-hearth furnaces. Scrap charging at a new electric arc steel-making plant where wagons, instead of the usual magnet crane, are used is described. Discussion of additional aspects of scrap handling includes assisted melting of scrap, operational research into problems of handling and charging scrap, the regional pattern of supply and demand, progress within the scrap industry, and technical cooperation. The importance of research on scrap and the development of improved techniques for handling and reprocessing scrap are stressed.

65-0553
The inside story on waste paper. Public Cleansing, 55(12):689 Dec. 1965.

It has been calculated that in 1964 waste paper recovery saved Great Britain approximately 60 million pounds in terms of wood pulp which would otherwise have to be imported. Local government officials have been wary of the argument that recovery of waste paper conserves tipping space and reduces costly disposal operations. However, the volume of paper is increasing and is beginning to justify its separate collection and disposal. In relation to the national economy, there is little doubt as to the merit of salvaging waste paper.

65-0554
Klass, C. P. Deinking--an art reaches to become a science. Paper Trade Journal, 149(42):46-49, Oct. 18 1965.

Papers presented at the 10th Annual Deinking Conference held on Oct. 6 to 8, 1965 in Boston are reviewed. The highlight of the two-day meeting was a description of the 25 tpd unique flotation deinking system, which has been in operation at Kimberly-Clark's Niagara Falls, New York mill since April, 1965. Other papers presented include: (1) a preliminary report on the effect of cooking variables on the properties of deinking fibers; (2) the dyeing of secondary fibers; (3) sizing of secondary fibers; (4) a comparison of the physical and optical properties of unbeaten deinked pulps and virgin pulps; (5) the functions of surfactants in deinking; (6) a comparative study of the physical properties of pulps made from rags, linters and cottom linters; (7) the effects of bleaching by various methods on the physical characteristics of deinked pulps; (8) the importance of quality water in a secondary fiber mill; and (9) a description of an ideal deinking flow diagram. The meeting ended with a panel discussion on the problems encountered in the use of secondary fibers and panelists offered their thoughts about the future of deinking.

65-0555
Load cells speed scrap gathering. Waste Trade World, 107(3):7, July 17, 1965.

The Martin-Decker tension load cell completely eliminates the need for a fixed central weighing station. Scrap is now gathered from all points in the yard then carried directly to the charging cupola while being weighed en route. This practice of weighing, while loading or gathering, by-passes the wasteful and time-consuming stopover at a fixed location scale. The size and shape of scrap is often deceiving, and needless trips to and from the charging cupola are saved by weighing while loading. Charging time is cut also, because optimum charge is ensured every time. Easily installed, the load cell eliminates guesswork on the part of the lift truck operator. Tension or compression models are available.

65-0556
Maslova, L. G. Biosynthesis of vitamin B12 in methane fermentation. Washington, U.S. Army Foreign Science and Technology Center, 1965. 5 p.

Fermentation industry by-products are utilized to produce vitamin B twelve by thermophilic methane fermentation. Industrial methane fermentation is carried out with a mixed culture of bacteria which allows the use of nutritive and nonnutritive waste products as nutrient media. Experiments were carried out to produce B twelve from potato starch production by-products. Results showed that a necessary condition for the fermentation of the by-products of potato starch production is the maintenance of the ratio between carbon and nitrogen in the substrate within limits of 10 to 16:1. The addition of cobalt salts increases the yield of vitamin B twelve threefold.

65-0557
Misra, D. K. Indian mill produces printing papers from bagasse pulp. Paper Trade Journal, 149(17):47-49, Apr. 26, 1965.

Paper with 100 percent bagasse pulp was produced at the Mandya National Paper Mills of Belagula, India. Mandya maintains a Horkel depithing station at a sugar mill 26 miles distant, where 65 to 70 percent of the pith is removed from the bagasse. The pith is combined with unexchanged bagasse and is burned in the sugar mill's bagasse-fired steam boiler. Twenty percent dry bagasse is obtained by further upgrading at the pulp mill by another wet depithing system. This bagasse is digested in a Black Clawson Pandia continuous digestion system and enters the cooking zone containing a residual pith of 4 to 5 percent.

It is cooked for 10 to 12 minutes at a steam pressure of 110 psi. and free residual alkali in the black liquor is maintained between 8 to 10 gpl, producing unbleached screened pulp in 50 percent yield. The pulp is bleached in a three-stage bleachery employing a chlorination caustic extraction and calcium hypochlorite sequence. It has a G. E. brightness of 80 and a TAPPI viscosity of 40.0 cp with a pentosans content of 23 percent and 77 percent cellulose. After passing through one hydrafiner and one jordan the stock freeness is developed to 40 to 45 SR and is then processed in a paper machine with a 138 in. wide wire and a wire length of 85 ft 4 in. Data on the bulk, burst factor, tensile strength, breaking length, tear factor, and double fold is given for 100 percent bagasse paper, and it is concluded that although 100 percent bagasse paper is of excellent quality, paper containing 20 percent fiber is preferable.

65-0558

Misra, D. K. Utilizing bagasse for papermaking in India Mandya Mill is significant. Tappi, 48(7):88A-92A, July 1965.

In India, the shortage of conventional raw materials for papermaking such as bamboo, sabai grass, soft wood, rags, and hemp has caused difficulties in supplying sufficient raw material. Operation of the first pulp and paper mill in India to utilize bagasse for the production of acceptable paper from 100 percent bagasse fiber is described. The factors involved in the pulping process and the paper machine operation are discussed together with the importance of papermaking to the economy. The collection of depithed bagasse, the technology developed at the pilot plant operation, and the significance of the information obtained in the utilization of bagasse are covered. Photographs show the Mandya National Paper Mills where bagasse is fed to a depithing system, baled for storage, washed, screened, and bleached. There is a picture of the French-made paper machine with a 138 in. wire. Data obtained in the experimental runs on strength of paper, fiber classification, pulp analysis, and characteristics of the bagasse pulp are given. The bagasse has to be depithed preferably at the sugar mill and enough bagasse has to be collected in the 180 day crushing season to last the year. With 150 percent bagasse pulp, the speed of the paper machine is limited and the length of the four drinier wire should be increased to permit adequate water removal. It is doubtful if a mill based on a 100 percent bagasse pulp is commercially feasible in the present market

65-0559

Mueller-Rid, W., and H. Ortner. Stock preparation from secondary fibers. Part I. Paper Industry 47(3):50-56, Mar. 1965.

After a short survey of the types of wastepaper used in Europe, and especially in the Federal Republic of Germany, their share in the total supply of raw material for the paper industry and their utilization is briefly mentioned. The low consistency methods of waste paper stock preparations are described. The conventional low consistency method requires stock densities of 3 to 5 percent, whereas the second process requires these low consistencies only for the primary dissolution in continuous and discontinuous pulpers. A combined preparation unit, which means primary dissolution at low consistency and final dissolution at high consistency, can also be employed Four schematic flow sheet illustrations are given for the various stock preparation systems. The various pulpers used in these processes are discussed. After passing through the pulper the stock is then passed through a high consistency purifier and from there it can go with unchanged consistency to the deflaker. The various high consistency purifiers and deflakers and their advantages and disadvantages are described.

65-0560

Mueller-Rid, W., and H. Ortner. Stock preparation from secondary fibers. Part II. Paper Industry, 47(4):63-68, Apr. 1965.

Belt thickeners with low power consumption which are able to increase stock dryness from 3 or 4 percent to 25 to 30 percent or more, are described and illustrated. The three machines which have shown satisfactory results are the belt thickener designed by Boith, the double wire thickener by Maschinenfabrik Andritz, and the ErWePa-thickener. The stock passes from the belt thickener to one or more single shaft disintegrators, which are described, for final deflaking. For deflaking at high consistencies the Voith single shaft disintegrator is frequently used. The disintegrator is not suited for the deflaking of stock to be regenerated by deinking. The application and connection of the various stock preparation machines are explained. Schematic diagrams are given of: (1) a paper board stock preparation system producing 180 tons per day of imitation chromo-board, grey board, and steamed groundwood board; (2) a stock preparation system combined with a deinking system; and (3) a paper board stock preparation system in which underliners are made from deinked waste paper. The high consistency purifying, relining, and deflaking machines are also used for pulpers and fiberizing of large quantities of dry broke from internal production. In the case of smaller broke quantities, special pulpers were developed and are described and illustrated. The reasons for the differences in the machines needed in the United States and Europe are discussed.

65-0561
New reclaiming furnace. Waste Trade World, 106(22):7, May 29, 1965.

A new reclaiming furnace, developed for handling iron-containing aluminum and zinc, and for charging bulky materials which have to be run down into ingots, is described. The charge can also be run into bale-out furnaces for re-alloying. Melting and treatment are practically continuous, and as the molten metal runs from the material being reclaimed, it is collected in the pouring end of the furnace for casting purposes. The furnace is normally fired directly into the heating chamber by two burners. It is fitted with recuperating flues positioned in front by the large charging door, which keep a uniform temperature throughout the furnace and retains the heat when the door is open. The furnace is fabricated throughout with heavy steel and lined with the highest grade refractory to create radiation on the treated work. It is designed to use minimum fuel consumption per cwt of metal treated. The oil can be fed by gravity of the ring method, or fired by gas. Normal air pressure required at the burners, supplied from a high-pressure motorized fan, is 28 in. swg. With normal flues and ducting fitted above the furnace, there is an absence of objectionable fumes and/or smoke.

65-0562
New scrap shearing machine. Waste Trade World, 107(3):6-7, July 17, 1965.

A new British hydraulically operated double-sided scrap shearing machine which has a hold-down capacity of 100 tons and shearing force of 300 tons is described. This machine is called the Eldair and is manufactured by Weldall and Assembly Ltd., Stourbridge. It has the capacity to handle all classes of material, including 2 in. flat sections, 3½ in. diameter bars, 3 3/16 in. square sections, 12 by 5 in. RSJ's, 14 by 4 in. RSC's and any other material of 10 in. square cross-sectional area based on 28 to 32 tons tensile MS. The shear is a compact and self-contained ring frame type unit, which incorporates a scrap hold-down. A hydraulic scrap feeder or vibratory conveyor can be attached to the frame to form an integral part of the machine. The hydraulic oil reservoir with a capacity of 250 gal is carried on the top of two hydraulic cylinders, the hydraulic pumps have an operating pressure of 4,480 psi, and the machine is powered by a 50 hp electric motor. A feedbox which can be fitted to the standard machine as an optional is also described.

65-0563
Ortner, H. The technical state of deinking by flotation in Europe. Tappi, 48(2):37A-41A, Feb. 1965.

The consumption of softwood for paper is a serious drain on the forest reserves in Germany and Central Europe. In 1963, the wood saved by deinking and reclaiming amounted to 12.3 percent of the normal softwood reserves in the German Federal Republic. It was found that the costs could be reduced by equipment now available for deinking. This review article explains the principle of flotation of printing ink and gives the particulars on the power, water, and space requirements as well as the losses and cost of a flotation deinking installation. A flow diagram is given of the equipment used in deinking and the details of a screw centrifugal separator which is important in obtaining compliances with the laws governing waste water disposal in Europe. Sankey diagrams are given showing the water and stock balances of flotation deinking equipment. Pictures show a screw centrifuge and a secondary cell with highly concentrated froth obtained when air is blown through fibrous stock suspension containing insoluble calcium soaps which form sticky surfaces to which the ink adheres and is carried upward with the froth. A 50-ton per hr flotation machine is also shown. Toilet crepe uses 50 to 100 percent of deinked paper, and newsprint contains 15 to 20 percent. In board mills 100 percent of deinked papers are used in underliners, blackliners, and topliners. Flotation deinkers are successful not only in Europe, but in Argentina, Japan, and South Africa.

65-0564
Paper from cane waste. Waste Trade World, 106(6):8, Feb. 6, 1965.

An announcement is made of the use of bagasse (sugar cane waste) in a paper mill to be built at Ishwardi in East Pakistan. Government permission has been given for its establishment under the direction of the East Pakistan Industrial Development Corporation to be known as the North Bengal Paper Mill. The mill, which has an estimated cost of Rs 78,010,000, will have an annual production of 16,500 tons of high quality paper.

65-0565
Paper salvage. Public Cleansing, 55(11):610-620, Nov. 1965.

A joint meeting between British municipal cleansing officers, and a panel from Thames Board Mills, which produces 45 percent of the paperboard and 20 percent of the solid corrugated cases made in the United Kingdom is described. T. B. M. consumes 400,000 tons of waste paper each year. It sponsors businesses which organize wastepaper and wasteboard collections from large industrial users, and aids municipalities, publicizes, and organizes separate wastepaper collection from household. The trend is from solid cardboard to the lighter corrugated board. Trailers behind packers are convenient separate wastepaper collection devices. To minimize the gamble to municipalities who must finance the institution of a separate wastepaper collection system, T. B. M. guarantees acceptance of a minimum tonnage for 3 years ahead, and a minimum price, relatively stable, for about 1½ years.

65-0566
Parthasarathi, M. N. Sources of secondary zinc and their utilization. Research and Industry, 10(11):329-331, Nov. 1965.

Although secondary zinc is limited compared to other metals, a survey was made of the sources of secondary zinc available in India in quantity which would not require the import of specialized equipment for the recovery of the zinc. Although there would be collection problems, there is a potential source in the spent cans from used flashlight batteries. It appeared that the galvanizing industry was the most important source of secondary zinc in India. The residues available include zinc dross, galvanizer's ash, flux skimmings, and steam blowings from tube galvanizing. The dross is an alloy of iron and zinc containing 96 percent Zn which settles at the bottom of the zinc bath and is removed from the galvanizing bath in the form of lumps which are melted down and cast as slabs of 'hard zinc' or 'hard spelter' which is currently used to replace virgin zinc in brass. At least 10 to 15 percent of the total zinc used in galvanizing in India is converted to dross. The zinc may be recovered from the dross by distillation, which, however, would require the import of retorts and condensers. The manufacture of dust from dross, a slight modification of the distillation technique, is the best method for utilization of the zinc dross. Equipment cost of imported material is only a minor cost compared to the value of the zinc tonnage recovered. The ash may be used to manufacture various zinc compounds and metallic zinc. It was concluded that it would be in the interests of the country to encourage the reclamation of Zn from galvanizing plant residues, either as slabs or dusts.

65-0567
Portable balers. Waste Trade World, 107(1):19, July 3, 1965.

The Portabale, a manually operated, mobile baler which can be taken to the material when required, is described. The thrust will depend on the operator, but 1 to 1¼ tons is the average thrust on the bale. The operation can be carried out by one unskilled operator. The bales are formed in a detachable truck, which eliminates handling. Various types of material such as aluminum, cardboard, paper, etc., can be baled in an average time of 6 minute with final dimensions 13 in. wide by 28 in. long by 25 to 33 in. high. Price is £135. The Electrobale, a power baler with press-button operations, is also described. It is capable of handling a wide range of materials and can be taken to the desired spot and left to operate automatically in complete safety. Baling material can be assembled while a bale is being produced. Bale size is 30 in. by 30 in. by 14½ in., and reduction size of bale is possible. Price is £295.

65-0568
Questions and answers on waste paper for board. Public Cleansing, 55(4):183-185, Apr. 1965.

Comments of a cardboard manufacturing company manager on questions about the market for wastepaper in Britain are reported. The demand is much greater than production, and long-range need will continue to encourage enlarged marketing and given confidence to cities considering initiating either salvage pickerbelts or separate waste paper collection systems.

65-0569

Salvage baler. Public Cleansing, 55(5):295-299, May 1965.

A new salvage paper baler is described. It operates pneumatically, loads and cycles rapidly, and presses about 500 lb bales.

65-0570

Schroder, F. The research institute for blast furnace slag and its work. Tonindustrie Zeitung und Keramische Rundschau, 89(7/8):146-154, 1965.

In steel production more than 100 million tons of slag are produced worldwide annually. In the last few years it has been possible to utilize completely these residues from the steel production. Through various cooling processes, the blast furnace slag is converted into raw material or construction material. A table lists in detail the manifold treatments and possibilities of utilization. A research institute was established in Germany to find new ways for using the slag and to find new methods for improving its quality. A detailed description of the equipment in the laboratories and various examples of research carried out by the Institute are given. For instance, the hydraulic properties and the microstructure of slag were investigated. (Text-German)

65-0571

Scrap processing plant for Australia. Waste Trade World, 107(2):13, July 10, 1965.

M and T Chemical have ordered a Scrapmaster TGS101 from Sheppards of Bridgend, England, for their new Australian works. The TGS101 is a bigger version of the popular TGS57. It has a charging chamber 40 in. wide, 36 in. deep and 100 in. long. Bale sizes are 12 in. by 12 in. by variable, 14 in. by 14 in. or 16 in. by 16 in. variable length. Output averages 100 bales an hour. The TGS101 has the unique Scrapmaster method of operation, which subjects scrap in the charging box to three separate and independent compressions. This produces bales of dense construction, a typical bale weighing 22 lb per in. of length.

65-0572

Sintered fly ash goes to market. Electrical World, 163(26):94-95, 142, June 28, 1965.

Consolidated Edison Co. is now commercially converting fly ash into lightweight aggregate for use in concrete products at a new $3 million sintering plant with a capacity of 1,000 tons per day. This sintered product is competitive in price and produces concrete of the same strength as ordinary aggregate, but weighs one-third less per cu ft. A diagram portrays the sintering process from the collection of the fly ash on the precipitators to the final load-out stage. The fly ash is pelletized without binder admixtures and fused at 2,300 C to form a hard porous material. The fly ash which is collected at the precipitators of the five Astoria generating station boilers is transported pneumatically from the collectors to the sintering plant through steel pipes. Studies indicate it would not be economical to transport the fly ash collected at other stations by truck to Astoria. Structural grade sintered fly ash is delivered to the ready-mix concrete plants in the nominal sizes of ¾ in. to No. 4 as called for in the American Society of Testing Materials specification C330. Ninety-five percent of the finished product consists of unbroken pellets.

65-0573

Smith, W. H. Kraft pulping from sawdust and shavings in a continuous digester. Paper Industry, 47(8):45-46, Aug. 1965.

A continuous digester for the production of kraft pulp made from sawdust and shavings is described. The sawdust and shavings delivered to the mill are screened to remove oversize material and then run through a Verti-Flex to even the bulk density of the material and facilitate feeding into the digester. A moisture detector is included among the preparatory steps and reads out a correct percentage B.D. of the material, which allows further control of the residuals to the digester to maintain the B.D. tonnage at 50 percent B.D. weight of the material. This feature is very important since control of wood rate to a given percentage B.D. is necessary for the control of pulp quality. The continuous digester is powered by a 10 hp variable-speed drive unit which gives a retention time of 20 to 40 minute. White and black liquor are added to the digester to maintain desired kappa number and total volume and level. Steam is added to the top of the digester to maintain an operating pressure of 145 psi and a cooking temperature of 365 F. Steam consumption averages 4.0 M lb per pulp ton. Stock is discharged through an outlet valve and pulp is blown into a cone-bottomed blow tank, where it is diluted to a consistency of 3.5 percent and then pumped to another blow tank and mixed with pulp made from chips in stationary digesters. The pulp mixture is washed and screened over vacuum washers. Values are given for tests on the pulp made from sawdust and shavings. Present developments to improve and expand the residual cooking and handling system are outlined.

65-0574
Stevens, R. P. New machines speed corrugated collection and disposal. Refuse Removal Journal, 8(10):25, Oct. 1965.

There are three major sources of paper stock available. The first is the direct producer such as box shops and others that bale their own material. This source produces the best quality paper stock. The second source is that stock baled at various landfill sites. This is usually free from contaminants if a moderate amount of supervision is maintained over the salvage operators. The largest suppliers, refuse removal companies, are dealt with in greatest detail in this article. Salvaging is made more difficult by various contaminants present in refuse, such as wax- and foil-coated stock and plastic bags. The most commonly used method for handling old corrugated cartons is the transfer body. This is an expensive method, however, and the installation of hoggers and shredders and new more integrated methods promises a less expensive and more efficient method of salvage.

65-0575
Stirrup, F. L. Salvage and utilization. In Public cleansing; refuse disposal. Oxford, The Institute of Public Cleansing, 1965. p.119-136.

Salvage is material sorted from refuse and prepared for sale as a raw material which can be incorporated in the manufacture of commodities. Utilization is the treatment of conversion of parts of a mass of refuse to make it usable in industry, agriculture of domestic life. Waste paper must be free from dirt, collected separately, and sorted into grades. A conveyor of woven wire mesh allows dust and small contraries to pass through. The paper enters either the continuous or swivel box baler. It then enters single or twin ram fixed box press and is stored in twin ram movable boxes. Tins and small ferrous metals are removed by magnet and baled; larger ferrous metals are picked by hand. The primary non-ferrous metals utilized are copper, brass, aluminum, and lead. Textiles are sorted into woolens, mixed rages, sacking and bagging, carpets, and string. Glass cullet is sorted into white and colored. Bones are used for glue, fat, and bone meal. Rubber basically is not salvaged. Food wastes are to be heated if used as a feeding stuff. By-products from animal wastes: blood, condemned meat and fish, bones, carcasses, and offal can be used for fats, grease, and fertilizers. Moisture content should be less than 10 percent to prevent mold. Fuel can be made from refuse briquettes, but it will disintegrate if exposed to moisture.

65-0576
Taconite reacted with steel scrap can become feed to a blast furnace. Chemical Engineering, 72(3):22, Feb. 1, 1965.

The Bureau of Mines of the Interior Department has developed a process which converts nonmagnetic taconite into magnetite by reaction with scrap steel, which also changes into magnetite, a product widely used as raw material for blast furnaces.

65-0577
Thorman. Conference in Weimar on the utilization of blast furnace slag. Tonindustrie Zeitung und Keramische Rundschau, 89(13-14):308-309, 1965.

At the University for Architecture and Construction in Weimar, Germany, a meeting was held in April 1965. Several papers were presented, mainly on the utilization of blast furnace slag. The addition of slag to concrete was suggested. The sintering of slag was discussed as well as the influence of manganese oxide and aluminum oxide on the water affinity of slag, the utilization of slag in construction, etc. Eleven articles were presented. The contents of each is briefly mentioned. (Text-German)

65-0578
Trailers hooked to packers speed waste paper collection. Refuse Removal Journal, 8(11):28, Nov. 1965.

An English sanitation department initiated use of small, two-wheeled trailers for waste paper behind regular packers. Reported advantages include better service, economizing landfill space, extending life of equipment, and additional bonuses to workers from the sale of 3½ tons of paper collected by each team weekly.

65-0579
Trim removal plant. Research and Industry, 10(2):48, Feb. 1965.

A new trim removal plant, the 'Perflo Duct' which collects and removes all types of paper, cardboard, synthetic film and foil separately, is described. The device, developed by Musgrave & Co. Ltd., Belfast, United Kingdom, disposes of three different types of wastes without mixing them. The arrangement reduces capital and operating costs since the one device replaces three waste disposal machines. A photograph shows the trim removal machine which consists of a duct with three channels to transport the waste pneumatically from the machine to a discharge point. A machine in the production line is connected to any channel and the other two channels are blanked off at that machine. If the next machine has a different by-product it is connected to a different channel to keep the by-products separate. Perforated walls between each channel ensure free flow of air and adequate transport velocity throughout the system independent of the sequence of machine operation. A fan at the remote end of the duct sucks the by-products to the discharge point. The costs of disposal of mixed wastes is minimized by sorting the various types of trim at the point of origin and removing them unmixed, pneumatically to the discharge point.

65-0580
U.S. srive for scrap pay-off. Waste Trade World, 106(15):10, Apr. 10, 1965.

The conservation and reclamation of scrap are necessary to preserve resources and to protect the economy by providing the necessary raw materials for the manufacture of essential military and civilian items. With technological advances in military equipment, much of the material rapidly becomes obsolete and is ready for the scrap heap together with worn out material. The Defense Logistics Services Center at Battle Creek, Michigan, which has as its main objective to get the highest return possible for obsolete and scrap material, has trained over 1,200 from all the military services in the identification and segregation of scrap metal in schools and in clinics conducted throughout the country. The Defense Department has long recognized that identification and segregation pays, although the identification of modern metals and alloys is difficult. Every effort is being made to improve, modernize, and develop new techniques for the identification, segregation, and merchandising of scrap metals. In 1964, the Department of Defense realized $23 million from government scrap yards including 436,612 tons of ferrous and 90,878 tons of non-ferrous scrap. The sales of precious, ferrous and non-ferrous scrap metal accounted for more than 28 percent of the sales of all Department of Defense surplus material. There has been a 30 percent increase in non-ferrous proceeds during a three-year period ending June 30, 1964. A paper given by John W. McVicar, Defense Surplus Sales Officer Chief in March 1964 to the National Association of Secondary Material Industries Convention is summarized.

65-0581
Using computers to cut costs in making alloys from scrap. Waste Trade World, 106(16):10-12, Apr. 17, 1965.

It is general practice to use rough 'rule of thumb' calculations coupled with wide experience in the production of alloys from scrap. While this method gives excellent results, its weakness is that it is dependent on human judgement which varies from day to day and that calculations, in order to be done swiftly, must contain small inaccuracies and estimates which may cancel each other out, but may also result in errors of sizeable proportions. To make accurate assessments there is a general technique, known as the linear programming algorithm, which may be applied to such a problem as the blending of metals to make an alloy. Experiments using this technique showed that savings in the region of 10 percent in the cost of producing alloys were frequently possible. Computers which can be bought or rented can perform these calculations quickly and accurately for between £10 and £100, depending on the complexity of the problem.

65-0582
Utilizing waste oil. Waste Trade World, 107(13):6-7, Sept. 25, 1965.

Activities and exhibits at the Plant Exhibition and Demonstration, organized recently in Liverpool by the North-West Branch of the Contractors' Mechanical Plant Engineers, are reported. There was a lot of interest in special tires, particularly in partly used and large-size earthmovers. A waste oil burning heater which has been developed over a number of years to handle the twin problems of waste oil disposal and provision of heat in the workshop is described. All kinds of waste oil are burned cleanly in the Anderton without smoke or fumes, and it can be used as a space heater or for central heating and hot water supply. Output is 80,000 Btu's on all types of fuel. Other exhibits include the Atlas 3001 hydraulic lorry loader with new designing of boom and jib, the Avenger 10-ton lorry-mounted crane with a job unloader of simple construction, mobile cranes of 6, 10, and 15-ton capacity, and different types of grabs including a Bernard tentacle-type grab--all particularly useful in scrap handling.

65-0583

Utilizing forest waste. Waste Trade World, 106(11):7, Mar. 13, 1965.

A small state company in Hungary employs 1,400 permanent and 25,000 seasonal workers to scavenge forests for mushrooms, wild fruits, cones, and bits of wood previously considered without value. The timber scrap is purchased by small workshops to make into tool handles and kitchen spoons. Over 200 tons of birch twigs are exported to the West each year. The annual turnover of this forest 'scrap' is £2 million.

65-0584

Weiss, A. J. Guitar maker burns wood waste to heat plant. Heating, Piping and Air Conditioning, 37(7):91-95, July 1965.

The Kay Musical Instrument Co., which manufactures stringed musical instruments by a combination of machine and hand operations, has built into its new plant equipment which facilitates the burning of wood waste to heat the plant. Sawdust and wood are produced at rates up to 900 lb per hr and on a two-shift basis require two 165 hp boilers with wood-burning equipment. Woodworking machines are provided with hoods for collection of sawdust, and twin exhaust systems convey sawdust and shavings to a cyclone dust separator located above the boiler room. A rotary grinding mill reduces scrap to a size suitable for suspension burning. Large chunks of scrap material were originally fed into a wood grinder or hog, and discharged into the storage bin from a small separator. Problems in packing which arose from this method were solved by installation of a large cyclone which provided a more uniform material texture. The exhaust requirements of wood dust collection make it necessary to supply 100,000 cfm of tempered makeup air, which imposes a significant load on the boilers. Therefore, boilers with a total capacity of 330 hp are needed. Wood scrap is augered from the storage bin and dumped into the intake of a pneumatic conveying system, which delivers a mixture of wood and air to a boiler's firebox. Estimates on the basis of two-shift operation indicate the cost of natural gas for heating the plant would be $20,000 per year, while with the above procedure the savings in fuel costs will approximate $17,000.

65-0585

Wenzl, H. Developments in recovery of sulfite cooking chemicals. Paper Trade Journal, 149(24):51-59, June 14, 1965.

The various recovery methods for sulfite cooking chemicals with magnesium, sodium, and ammonium bases, as well as recovery systems for sulphur, are reviewed with reference to the literature. The process steps involved in the recovery of sulfite chemicals include: (1) evaporation or concentration of the spent liquor with liberated sulfur dioxide gas returning to liquor preparations; (2) combustion of concentrated liquor with liberated sulfur dioxide returning to liquor preparation; and (3) chemical conversion of the basic substances present in the smelt. Sodium base recovery methods involve two types of processes; the liberation of hydrogen sulfide from the ash containing sodium carbonate and sodium sulfide, and the direct oxidation of sulfide to sulfite. Those described in detail with accompanying flow diagrams are the Mead process based on sodium sulfite semi-chemical cooking; the Western Precipitation process based on separation by crystallization of the sodium carbonate and sodium sulfide from the smelt; the Sivola process based on two-stage cooking; and the Stora Kopparberg process which recovers elemental sulfur by dissolving the smelt from the recovery boiler. Other processes which require less evaporation or direct treatment of the spent liquor are described, including the AST process (atomized suspension technique) based on pyrolysis of the solids in the spent liquor and their conversion into gases, and the SCA-Billerud process based on the recovery of cations from the spent liquor by ion exchange. Ion exchange recovery methods, which require no previous concentration of the liquor and which use cation exchangers of the sulfonic acid type, are discussed, as well as electrodialysis, ammonium and magnesium base recovery, and cross recovery systems.

SANITARY LANDFILL

65-0586

Attig, G. K., and J. Clay. County in Oregon opens landfill to all citizens.

Refuse Removal Journal, 8(4):16-17, 28, Apr. 1965.

Oregon's Lane County operates a sanitary landfill which is available to the public. Heavier compaction equipment has doubled the lifetime of the fill, which will be developed into a county Park when completed.

65-0587
Bishop, W. D., R. C. Carter, and H. F. Ludwig. Gas movement in landfilled rubbish. Public Works, 96(11):64-68, Nov. 1965.

A test refuse fill was built in Southern California to determine the quantities of decomposition gases passing into the soil. Carbon dioxide was the only gas found in significant quantities in the adjacent soil. The reason for the experiment was to determine possible damage to the ground water supply from a sanitary landfill.

65-0588
Black, R. Sanitary landfills. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health, p.G-1 to G-26.

Sanitary landfill is defined, emphasizing that the refuse must be covered with a layer of earth at the end of each day or at more frequent intervals if necessary. Four methods of disposing of refuse on land are: open dumping, controlled burned dumping, refuse filling, and sanitary landfilling. Their respective costs are given and the methods are compared. Successful sanitary landfill operations have competent and continuing engineering planning and control. Research in the field is noted. The operation of three sanitary landfills in the Los Angeles County area are specifically examined. One of the important advantages of the sanitary landfill is that variations in the character or the quantity of the refuse received have little effect on normal operations. Since cities must dispose of large portions of their refuse on land, whether incineration, composting, or some other volume reduction method is also used, some type of land disposal will continue to be widely practiced in the United States. Since present sanitary landfill techniques eliminate nuisance and public health hazards, they will continue to be more commonly used. Questions concerning costs, the water table, seasonal operations, the degrading of landfill sites, weighing, the mechanics of compaction, resident setback, and others were answered after the formal paper.

65-0589
Booth, E. J. Buried 25 years and still legible. American City, 80(7):26, July 1965.

The opening of a 25 year old landfill has revealed papers and books that are still legible and auto motors still in good shape, indicating the slow decomposal rate in landfills, particularly in dry areas.

65-0590
Controlled tipping must continue. Surveyor and Municipal Engineer, 125(3809):49, June 5, 1965.

The need for controlled tipping in spite of the increasing trend towards the pretreatment of refuse by incineration, pulverization, and composting was discussed by S. K. Sheldon in a paper given to the Institute of Public Cleansing Conference at Scarborough this week. It would be uneconomic and physically impossible to change the form of disposal now being used by most authorities in the near future. The recruitment of suitable tipmen is a problem, because of the nature of the work. The men should be given a sense of partnership in a worthwhile project. They should be outfitted with first-class protective clothing, a warm, clean, dry cabin with simple washing facilities and the best possible amenities. The changing nature of refuse, with the increase in paper and cans has created difficulties at the dumps by creating voids which cause uneven sinkage, difficulty in covering, and nuisance from blown refuse. Consolidation of the surface near the tip face to reduce the voids before covering can be obtained by bulldozers, loading shovels, or the use of the refuse vehicles to run in the surface will help with the problem, although a greater amount of covering will be needed than formerly. The surface of the tipping bay becomes rigid and corrugated from the uneven settling and this hazard to the trucks can be controlled by backblading and filling of the depressions. Chicken wire at the tip face is used to control light wind-blown refuse. Controlled tipping must continue and the necessary steps should be taken to lessen the present problems.

65-0591
Denver's new fill to last 40 years. Refuse Removal Journal, 8(3):14, Mar. 1965.

Denver, Colorado is spending a total of $370,000 for the expansion and modernization of its refuse handling facilities. The city is building a $295,000 equipment service yard and trash transfer station on a recently purchased 26-acre site. Another $75,000 is allocated for landfill and earth-moving equipment that will be used at its new dump site on the old Lowry Air Force Base bombing range. The city has title to 2,680 acres of prairie land that was once part of the Lowry bombing range. This virgin area is sufficient to take care of Denver's needs for the next 40 years. The new transfer station will be used as a point where rubbish compaction trucks on regular neighborhood pick up routes can empty their loads into larger carriers for the long haul out to the bombing range landfill. It will also be a materials storage yard. When the two sites are in operation it will permit the city to discontinue its trash burning activities at a location east of town.

65-0592
Early bird gets a 60-acre bonus. American City, 80(11):44, Nov. 1965.

The City of Raleigh, North Carolina, switched to sanitary landfill in 1939. Because of this decision, Raleigh now has 60 acres of reclaimed land adapted to park and commercial use. The Division of Sanitation employs an International 175 loader and a Hough H50 to work current landfill sites. The ramp-trench method disposes of more than 1,500 cu yd of refuse per day.

65-0593
Eldredge, R. W. Open dumps. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.F-1 to F-10.

Although open dumps are archaic, they are the most prevalent method of solid waste disposal. The operation of an open dump requires construction equipment for 'dozing' down the dumped refuse which are financed through revenue all too frequently obtained through other departmental funds. An open dump can cause air and water pollution. Refuse contains mineral and organic substances which can seriously pollute underground water supplies. Data is furnished showing the necessity for better refuse disposal methods through the control of disease vectors. The host-parasite and host-vector relationship is a complex interplay of the factors of reservoir, parasite, vector, and host which result in disease or immunity. Although it is difficult to eliminate any one of these factors, the partial reduction of any two reduces the potential of vector-borne diseases. The reduction of food and harborage through the elimination of the open dump will reduce the factors representing vectors, reservoirs, and associated parasites. The particular vectors and the diseases they transmit are listed. The problems involved in the conversion of an open dump to a sanitary landfill are considered. A properly operated sanitary landfill eliminates burning and decreases pollution. The employment of a pest control officer to eliminate the rodent-vector before the closure of an open dump is suggested. There must be total planning.

65-0594
Engineering-Science, Inc. In-situ investigation of movement of gases produced from decomposing refuse. Sacramento, California State Water Quality Control Board, 1965. 211 p.

This study was made to determine the amount of ground water pollution resulting from movement of gases within the soil. The test site used for this study is located in a three-quarter acre pocket situated in the floor of a gravel excavation directly east of the Sante Fe Flood Control Dam. Walls of the pit are approximately 100 ft in height with walls of the pocket 25 ft in height on three sides. Selected refuse was domestic and residential with no industrial-, commercial-, or demolition-type material included.

Forty-two gas sampling probes and thirteen combination temperature-moisture detection units were installed. Thirteen gas sampling wells were drilled outside the fill area. A fourteenth well was drilled through the center of the fill itself. At least monthly sampling analysis of probes within and outside refuse fill were made for determining gas production and movement during the early and later stages including determinations of water, methane, hydrogen, carbon dioxide, hydrogen sulfide, or oxygen and nitrogen. Porosity of soil was determined and monitoring of temperature, relative humidity, pressure, and rate of decomposition of the fill. Results showed carbon dioxide being the only apparent decomposition gas passing into the soil in significant quantity. Calculations show that by far the greater amount of carbon dioxide leaving the refuse goes into the atmosphere. Predictions are made for rate of carbon dioxide movement in future years. Present studies are being made for control of gas movement from refuse landfill.

65-0595
Goodrow, T. E. Sanitary landfill becomes major league training field. Public Works, 96(8):124-126, Aug. 1965.

The construction of a baseball field out of a sanitary landfill in St. Petersburg, Florida, for the St. Louis Cardinals' farm teams is described.

65-0596
Hachett, J., R. Black, and R. Smith. Sanitary landfills. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.H-1 to H-25.

Landfill results in a large variety of waste products with many chemical and biological constituents. These can be classified into: domestic refuse, industrial waste, used construction material, and incinerator ashes. The physical environment of the landfill site is affected by: the rates of decomposition of the fill, the production of contaminants, the retention or spread of these products which are determined by the meteorological, geological, and hydrological conditions of the site. Meteorological factors include precipitation, evapotranspiration, and soil moisture. Berkeley, California is analyzed for these factors. Geologic factors include permeability and the rock categories of un-consolidated material, consolidated sediments, chemical precipitates, and igneous and metamorphic materials. Various species of rats are found at dump sites. Other wildlife problems cited are the problem of dogs and cats attacking people and spreading rabies, and sea gulls and other bird problems. All the wildlife problems of any type can be solved by removing the garbage (the food source). Questions about the control of snakes around dumps, the use of dumps by game birds, and chemical applications were answered. Other questions were about the data available through the state or the U.S. Geological Survey, and possible chemical pollution of wells in a sand and gravel strata.

65-0597
How to use your completed landfills. American City, 80(8):91-94, Aug. 1965.

Results of a survey conducted by The American City on municipal use of completed sanitary landfills are reported. Gas production and ground settlement were the two main problems. Houses, buildings, roads, and sewer and water lines all suffered from settlement, and five dangers developed in basements of buildings built on or near completed landfills. Pilings through the landfill offered good foundational support; however, excavating in old landfills was an odoriferous process. Minimum housing requirements are suggested. About 90 percent of the settlement takes place in the first 5 years after a landfill is completed. Parks, golf courses, playgrounds, water pollution control plants, parking areas and supply yards were all successfully operated on completed fills, although methane gas problems occasionally had to be solved. The success and failure of a variety of municipal landfill use projects are recorded.

65-0598
Hueppelsheuser, L. D. For putrescibles only. American City, 80(1):18, Jan. 1965.

Flagstaff, Arizona, has changed from an open dump to a trench-type, 29-acre sanitary landfill, which only accepts putrescibles because of the scarcity of sites. A northwest dragline with a one-cu-yd bucket excavates the trench.

65-0599
Kandra, G. A. Tire failure no longer a problem. American City, 80(3):104-105, Mar. 1965.

Bativia, New York, has switched from a track-type tractor to a rubber-tired loader for its sanitary landfill operation. The loader provided a higher degree of maneuverability while compacting and backfilling, reduced shuttle time between the borrow pit and the working face of the fill and thereby eliminated a dump truck, compacted the refuse more thoroughly, and was more economical.

65-0600
Koch, A. S. Sanitary landfill lives up to the county's expectations. Public Works, 96(7):70-71, July 1965.

In 1959 after extensive study, Orange County, California, produced a 'Master Plan of Refuse Disposal' which was to provide guidelines for solving its shortage of disposal sites for at least 20 years. So far the plan has been successful and economical. It currently calls for the employment of three canyon-bottom landfill sites and three transfer stations.

65-0601
Kunimoto, Y. For better breathing: a landfill. American City, 80(10):62, Oct. 1965.

Landfill operations conducted by the City and County of Honolulu, Hawaii, are described. The landfill replaces an odiferous, smoking, open dump located in an area subject to atmospheric inversions. The numerous complaints received from residents, particularly bronchitis and asthma sufferers, stopped abruptly as soon as conversion took place. The landfill operates seven days per week. Residents deposit their trash without charge, but businesses must pay $0.75 for the first cu yd and $0.50 for each additional yd per truck load. The landfill disposes of about 5,600 ton per month. Wetting down the incoming refuse for better compaction was abandoned because mud and debris repeatedly clogged the inlet strainer, the swamp water had a foul odor, excess water muddied the truck route, and the long pipeline interfered with the operation of the landfill. An Allis-Chalmers HD 21 dozer is used for compacting the refuse, and spreading the cover material which is obtained from a nearby quarry.

65-0602
Landfill replaces open dump. Refuse Removal Journal, 8(3):24, Mar. 1965.

Wetumpka, Alabama, replaced an open dump, which was a constant health hazard and eye sore, with a sanitary landfill.

65-0603
Langer, W. Measures and facilities for the protection of potable water reservoir areas. Wasser und Abwasser, 106(8): 207-211, Feb. 1965.

To protect the drinking water in valleys dammed for water supply purposes, no waste whatsoever may be deposited in reservoir areas without previously testing the water permeability of the ground. It is recommended that sanitary landfills be established outside the protection area. Very often waste is dumped into ditches and behind bushes so that it cannot be seen but it can contaminate the drinking water. No traffic should be allowed to go through such areas because traffic brings a lot of waste along with it. (Text-German)

65-0604
Los Angeles warned about shrinking disposal areas. Refuse Removal Journal, 8(9):29, Sept. 1965.

In a report on the status of refuse disposal facilities in Los Angeles County, John A. Lambie, County Engineer, said that at least six more landfill sites should be acquired soon to keep abreast with the growing population.

65-0605
Milwaukee facing shake-up due to lack of disposal sites. Refuse Removal Journal, 8(2):24, Feb. 1965.

Milwaukee, Wisconsin, is considering a proposal to increase incineration if they cannot find a suitable landfill site. The City also might combine the Garbage Collection Bureau and the Bureau of Stre Sanitation into a Bureau of Sanitation fo economic savings.

65-0606
Obtain fill areas by tax foreclosure. Refuse Removal Journal, 8(2):35, Feb. 1965.

Thirty-nine acres of undeveloped railroad property have been obtained through a tax foreclosure by the City of Newark, New Jersey, and will be used as refuse dumping grounds. The new acreage is expected to be useful for 5 to 6 years, and will save $30,000 in disposal costs for 1965. Newark now dumps most of its refuse in nearby Kearny, but the pact expires in 1969 and a renewal is not expected. Since New Jersey health laws require, for every 4 ft of refuse dumped, a 12 to 18-in. covering layer must be spread, Newark presently spends about $50,000 a year for landfill cover material. Some of the new land, when completely filled, will be suitable for redevelopment. If all refuse dumping had to be done at Kearny, it would have meant $250,000 in increased costs.

65-0607
Parkhurst, J. D. Sanitary landfill operations in Los Angeles. Sanitary landfill operations in Los Angeles. Public Works, 96(11):54, 56, 1965.

Since 1955 design and manufacture of earth moving machinery have been improved; this machinery provides the primary tools for sanitary landfilling. Refuse in Los Angeles is pushed up a ramp for compaction on about a 20 percent slope by crawler tractors of approximately 50,000 lb gross weight equipped with U-blades. As tonnage increases, self-propelled, rubber tired scrapers are used to cover the refuse with earth. These are of the twin-engine type, with all-wheel drive, most being able to load themselves without aid from a tractor. The smaller sites have 14-cu yd machines, and the larger sites 24 cu yd units. Water wagons are also a necessary equipment used extensively for dust control on roadways and at the dumping area. The latest machines have a 6,000-gal capacity, with custom-made tankers built around the tractor of a single-engine scraper. They have a special low-profile design to provide operator visibility, and are equipped with a special monitor aimed with air-operated cylinders which can spray up to 100 ft. The per ton operating costs at District landfills have remained stable and even decreased slightly, while general construction costs rose about 30 percent.

65-0608
Qasim, S. R. Literature review. In Chemical characteristics of seepage water from simulated landfills. Morgantown, West Virginia University, 1965. p.3-20.

A total of 55 papers and reports are covered, all pertinent to the research carried out. Topics reviewed are: breeding of pest in refuse and the possible spread of disease; water and air pollution from waste; sanitary landfill as an effective means of disposal; and methods of landfill--their degree of compaction and amount of settling. The information of the amounts of refuse produced and its physical composition from a number of cities is combined into a table. The chemical composition of mixed refuse is dealt with, and a table combines the information from several sources. Data on heat generated in compacted landfill refuse from several sources is discussed. The chemical analysis of material leached from landfills, the effect of degree of decomposition on the materials leached out and their possible contribution to ground water pollution are covered next. Studies on the changes in bacterial population with the age of the fill and the ability of the soil to filter out bacteria from seepage is also discussed. Data showing the similarity of leaching to chromatographic action are included.

65-0609
Qasim, S. R. Summary. In Chemical characteristics of seepage water from simulated landfills. Morgantown, West Virginia University, 1965. p.104-106.

Temperature rise could not be used to reflect the progress of microbial activity because of excessive heat loss through the walls of the cylinders. The maximum settlement rate occurs in the first two weeks. Percolation of water through the refuse beds is delayed due to high moisture retaining capacity of the refuse (a.62 in. of water per ft of bed depth). The leach samples were rich in both organic and inorganic components, the deeper the fill the higher the concentration but, on a per foot of fill depth basis, less was extracted from the deeper fills. The percent reduction of leached materials during the test period was greatest for the shallower fills. For the leaching of chloride there was good agreement between experimental and theoretical results based on Thomas and Hiester's column ion-exchange and adsorption process. The pH of the end of the experiment the total bacterial population was down from 92 to 97 percent and the coliform group by from 97 to 99 percent. The leach samples were well buffered at all times (a high acid and base neutralizing capacity) due to the formation of weak acids from decomposition of organic matter. An assessment of pollution based on the extracted material from the fills showed that for an equal amount of influent shallower fills had a greater extraction rate per acre-foot and were therefore a greater pollution hazard. Volatile contents of the refuse decreased with time and leaching. The nitrogen deficient portions of the refuse showed an increase in nitrogen as leaching was continued. The C:N ratio decreased with time.

65-0610

Qasim, S. R. Conclusions and recommendations. In Chemical characteristics of seepage water from simulated landfills. Morgantown, West Virginia University, 1965. p.107-108.

Refuse fills are capable of seriously polluting underground water reservoirs through percolation and movement of carbon dioxide through the aquifiers causing an appreciable increase in hardness, iron, solids and different forms of nitrogen and sulfur. Although the chemical quality of seepage water and the magnitude and rate of extraction of material by it are determined, the dispersion phenomena during movement of pollutants needs further investigation. The permeability of the strata will decrease considerably during movement of pollutants from the fills, but whether an impervious coating or layer will form and break the moisture profile is not known. Since they affect the concentration of underground pollutants, data on the velocity, and direction of ground water movement and the depth of water bearing strata under prospective landfill sites will delineate the magnitude of the danger of pollution. Large volumes of carbon dioxide produced during the aerobic and anaerobic decomposition of refuse, if moved through the aquifier, will dissolve various minerals and degrade ground water quality. Methods to limit the gas penetration into the aquifier are desirable and should be investigated. Preliminary work with jar tests showed that various materials are released from refuse at different rates at various materials are released from refuse at different rates at various incubation temperatures. Information on the optimum mesophilic and thermophilic temperatures for the release of various materials from the refuse will be of great importance.

65-0611

Qasim, S. R. Appendix A. Methods and apparatus used in chemical and bacteriological analyses. In Chemical characteristics of seepage water from simulated landfills. Morgantown, West Virginia University, 1965. p.109-113.

Most of the methods used have been taken from the Standard Methods for the Examination of Water and Waste Water, 11th edition, 1960. Some of the modified methods have also been adopted for convenience. The information is presented in table form, the headings of which are: tests (the parameter), methods and special reference other than (Standard Methods), apparatus, and remarks (special conditions or changes).

65-0612

Qasim, S. R. Appendix B. Simulated landfill, temperature records, analyses of leach samples and refuse. In Chemical characteristics of seepage water from simulated landfills. Morgantown, West Virginia University, 1965. p.114-138.

All information is tabulated. For temperature: the date and time of and the air temperature at that time are given together with the temperature of the fill at various heights above the fill floor and the age of the fill at the time of measurement. For each leach sample taken, the results of the analysis for each of the following parameters are listed: total solids (mg per liter, volatile solids (mg per liter), alkalinity (as mg per liter CaCO3, end point pH 3.8), acidity (as mg per liter CaCO3, end point pH 7.2), hardness ((EDTA) as mg per liter), total iron (mg per liter), chloride (mg per liter), sulfate (mg per liter), total phosphate (mg per liter), tannin and lignin (mg per liter), BOD. (mg per liter), ammonia nitrogen (mg per liter, organic nitrogen (mg per liter), total nitrogen (mg per liter), pH, MPN (presumptive test), Standard plate count (20 C, 48 hr), spot check fluoride (mg per liter), spot check aluminum (mg per liter), spot check silica as SiO2 (mg per liter), spot check boron (mg per liter), spot check detergents (total apparent ABS (mg per liter)). Another table gives the cumulative values for each cylinder for each of the taken gives the cumulative values for each cylinder for each of the parameters listed above through total nitrogen. For each refuse sample taken from the simulated fills the following are reported: moisture content percent wet weight, volatile solids percent dry weight, ash content percent dry weight, total nitrogen percent dry weight, approximate carbon content percent dry weight, and approximate C:N ratio.

65-0613
Quarries become landfill in Texas. Refuse Removal Journal, 8(10):10-11, Oct. 1965.

San Antonio, Texas, has turned unhealthy and abandoned quarries into sanitary landfill sites. Some of the completed landfills have been converted into public recreation areas and parking lots. The city's collection and disposal system is highly efficient and the cheapest of the major U.S. municipalities.

65-0614
Sanitary fill supermechanized. American City, 80(12):20, Dec. 1965.

A new machine manufactured by the D and J Press Co. promises the ultimate in sanitary landfills. It compresses the refuse to less than 15 percent of its original volume in a compactor truck. It extrudes this tightly packed package into a trench that its excavating section has just dug, and covers it without the aid of other equipment. Two men operate the Big Squeeze refuse-disposal machine. The man in the forward cab controls the trenching, backfilling and earth-compacting operation, while the operator in the rear cab loads the hopper and controls all refuse-compacting operations. Two 450-hp V-12 diesel engines supply all power. The refuse trucks dump their entire load into the large hopper on one side of the machine. The operator raises the hopper to load the first compacting chamber. A platen compresses and forces the material into a smaller chamber where a second platen and a shear plate compress it still further. Two additional rams compress the bale from the smaller chamber. At the same time a wheel-type trenching unit on the opposite side of the machine excavates a trench 42 in. wide and up to 8.5 ft deep. The machine compacts fill material and levels off the area using a large dozer blade.

65-0615
Stirrup, F. L. Controlled tipping. In Public cleansing; refuse disposal. Oxford, The Institute of Public Cleansing, 1965. p.16-47.

Precautions must be taken in controlled tipping. Refuse should be deposited in layers with each layer covered with dirt. Avoid depositing in water and prevent fires or vermin breeding. Temperature should reach 150 F to kill pathogens. A site should be selected on the basis of: its depth, land restoration and improvement, length of haul, winds, its life and future use. In U.S. area required is one acre per 10,000 persons per year. Site operation depends on sound roadway construction, buildings, topsoil, and drainage work. Trench fills and bulldozers are used. A site may be difficult because it is waterlogged and must be drained, a deep valley, or it consists of sand or clay. Any inert material which will pack reasonably well can be used as cover. To control pests, have the cover prevent the penetration of food smell and gas the area. Tipped land may be used as recreation areas in the future. Have a topsoil cover of 6 in. to support growth of grass. The grass root should grow for one year to prevent broken glass from coming to the surface.

65-0616
Texas hauler operates fill jointly with municipality. Refuse Removal Journal, 8(3):18, 31, 38, 1-144, Mar. 1965.

Estes Service Co. and Tarrant County have joined together to operate a sanitary landfill outside of Ft. Worth. Before the merger, refuse was deposited in open dumps and burned. Estes Service has 32 trucks to service residential and commercial areas in the county. A breakdown of the locations and kind of the company's 538 containers is also given.

65-0617
Tracked vehicles for compaction. Public Cleansing, 55(7):429, July 1965.

A test in Dundee confirmed that wheeled vehicles achieve better compaction than tracked vehicles in sanitary landfill operations. However, this difference in degree of compaction was rather slight, and the tracked vehicle had many advantages economically and functionally. The tractive effort could operate where a wheeled shovel could not, and was also immune to punctures.

65-0618
1200-acre landfill contractor began in 1932 using pick and shovel. Refuse Removal Journal, 8(12):8-9, 18, 38, Dec. 1965.

The growth and management practices of a large Chicago landfill contractor, including description of operations at present disposal sites are outlined. The four landfill sites serve all areas of the city and many of the suburban communities, and are located in residential areas. Plans have been made and implemented to reuse the land after a landfill is completed. Initial public opposition to the landfills has subsided as former landfill sites are used for parks, schools, and apartment complexes. An extensive public relations campaign succeeded in getting land rezoned for a trench landfill. All disposal sites are enclosed by a cyclone fence. No salvaging is permitted, and neatness around the landfill is requisite. No burning is permitted at any time.

STREET CLEANING

65-0619
Bell, C. W. Stability and speed required. American City, 80(7):48, July 1965.

The new truck-chassis type sweeper in Neosho, Missouri, with 7,750 population is described. The new sweeper claims higher speed for trips to the dump, and greater stability and maneuverability than the conventional type it replaced, and also had the ability to clean outmoded, but still used, depressed gutters.

65-0620
Cardiff cuts street sweeping costs by 50 percent. Public Cleansing, 55(3):129-133, Mar. 1965.

Cardiff, Wales, a city of 264,000 with 328 miles of streets, reorganized their collection of street sweepings from mechanical and manual sweepers by using strategically located 6 cu yd dumpster containers. Originally 4 different systems were being employed including articulated vehicles at strategic points, exchangeable bins located at sub-depots, curb sweeping boxes which were periodically emptied by a collection vehicle, and two trucks which toured on planned routes. Three years ago the cost of this system was $12,000 per year. Then safe sites for the dumpster containers were obtained at suitable areas by congenial arrangements allowing the property owners to use the containers for their own refuse also. Two dumpsters and 30 containers are now used for collecting sweepings at one-half the cost of previous systems, and the department services have also been expanded.

65-0621
Danforth, H. L. How to keep gutters clean. American City, 80(7):48, July 1965.

Tucson, Arizona, has made a plea to shop owners and their janitors to pick up early morning store sweepings instead of sweeping them outside into the gutter only hours after sweeping by street machines. The program, which is designed to make the downtown more conducive for business, has been emphasized by cards and signs.

65-0622
Denison, R. E. Rate and up grade your street cleaning. American City, 80(4):120-122, Apr. 1965.

In order to rate and upgrade street cleaning service, officials must become familiar with job conditions and plan accordingly, organize men and equipment wisely, keep detailed records on their work, make cleaning schedules flexible, control parking by ordinance, balance labor and machines, tell their council exactly how much cleaning budgeted funds will buy, stimulate the public's interest in cleanliness, and up date sanitation and anti-littering ordinances.

65-0623
Drasler, L. L. Management of street sanitation operations. In American Public Works Association Yearbook, 1965. Chicago, American Public Works Association. p. 172-175.

The management of street sanitation operations in Cleveland is discussed, noting equipment, new techniques, difficult problems, and aid by legislation and education. Proper and continuous planning is necessary, and items to be evaluated include: comparison of performance between the districts, performance of each individual sweeper, an unbiased, weighted comparison of performance of sweepers of different makes, effectiveness of supervision and manpower, need for replacement of equipment, and the possible need for changing routes and/or working schedules. Cleveland has 35 mechanical sweepers; 10 flushers with leaf suction attachment will eliminate much hand labor. Improved broom material (polypropilene brush) is used. Savings without seriously affecting services were achieved by eliminating the assistant in the 2-man sweeping operation and in the area of equipment. In an effort to keep Cleveland beautiful, a Clean-up Campaign is held every Spring. The street cleaning program in Cleveland is successful because of an adequate budget for sufficient manpower and equipment, workable anti-litter and parking control ordinances and their enforcement, and continuous public education.

65-0624
50 brooms will sweep New York. Refuse Removal Journal, 8(5):35, May 1965.

New York City has purchased 50 tank-like mechanical brooms as part of its anti-litter drive.

65-0625
Green, L. B. We vacuum and flush our streets. American City, 80(5):104-105, May 1965.

In Montgomery, Alabama, a vacuum device was utilized to pick up an over-abundance of grass, and it proved so effective that it was used regularly. Formerly, streets were swept with a standard motorized sweeper, and the operator deposited the sweepings on the street for collection. The final step consisted of flushing to remove the last traces of debris and dust. This system required three vehicles, three operators, and three laborers. By using the vacuum cleaner followed by the flusher only, two vehicles, two operators and one laborer were needed. The Good Roads Scavenger's 12-yd capacity permits it to operate for a long period before dumping becomes necessary. Impressed with the results, the City Commission authorized the purchase of three Good Roads trailer-mounted vacuum Scavengers, and two additional flushers. The city has been divided into four sections with a foreman in charge of each section. The vacuum machines will clean 10 to 15 curb miles a day and burn about 30 gal of gas daily. Water tanks must be filled at least twice in 8 hr and the huge dust filters at the top of the containers must be washed daily to maintain peak vacuum efficiency. A machine used for street cleaning should have a vacuum system whereby the debris bypasses the fan blades. Units may include a sprinkler system to prevent dust and to aid in compaction.

65-0626
Haff, H. Street cleaning involves more than sweeping. American City, 80(7):100, July 1965.

The street sweeping program of Hempstead, New York, with 1,650 miles of street and 33 sweepers is reviewed. One hundred thirty-five town-owned parking lots are cleaned at night or early morning. Plastic fiber is used in the sweeping brooms, which are made by the city. The city also operates a small asphalt plant to patch road cuts by utilities.

65-0627
Hickok, R. Sweep sand with hickory. American City, 80(4):48, Apr. 1965.

El Paso, Texas, has switched back to hickory on the brooms of sweepers after an unsatisfactory trial with synthetic fibers. The apparent move against the trend elsewhere is attributed to the unusually heavy accumulation of sand which blows into El Paso's streets.

65-0628
Mechanical sweeping. Public Cleansing, 55(7):427, July 1965.

In a small city with a single street sweeping machine it seems that a suction type sweeper is preferred in spite of its higher initial cost, as compared with a 'sweeper-collector.' The advantages of such a suction machine are that it can lift wet or dry leaves from the pavement, and that it has fewer moveable parts which makes it less subject to breakdown.

65-0629
A part-time street sweeper. American City, 80(4):48, Apr. 1965.

The village of New Carlisle, Ohio, converts a multiple-use tractor to a part-time sweeper by replacing the bucket on the loader with an M-B LP Hydro pick-up sweeper.

65-0630
Pratt, L. C. Flush before sweeping for cleaner streets. American City, 80(3):118-120, Mar. 1965.

A description of the street-cleaning operation of Minneapolis, Minnesota, is presented. In spring, flushers wet down and wash the winter's accumulation of dirt to the side of the street to allay dust from sweeper collection; in fall, flushers dampen and soften brittle leaves so that sweepers can collect them in one pass. Occasionally, flushers are sent out to dampen loose chips resulting from seal coating before sweepers tackle them. Methods the city has employed to counter the parking problem and the city's street-cleaning fleet are described.

65-0631
Scottish center discuss mechanical street cleansing. Public Cleansing, 55(2):119-124, Feb. 1965.

Different types of sweeping machines were compared. Larger street cleaners, 6 ft wide were less maneuverable than the smaller 4 ft types in urban streets with parked cars. Transfer loading could remove the disadvantage of small capacity in the smaller machines. Suction-type machines have higher capital and lower maintenance costs than brush-type sweepers. Many suction-type sweepers had a relatively lower sweeping rate, but introduction of a separate engine for suction not only gave variability in speed, but also allowed use of duty-free fuel for the auxiliary engine. Tests upon polypropylene brush fibers have shown them to give satisfactory use and long life. Footpaths should be washed manually to avoid water in shop doorways and cellars. Men could pick up footpath litter in heavy pedestrian traffic more easily than a mechanical sweeper. Night use of mechanical sweepers in suburban areas must be limited because of noise and parked cars. It was suggested to base equipment comparisons on cost per thousand sq yd swept. Anomalies in Scottish licensing laws concerning street cleaning were also discussed.

65-0632
Sherrill, C. A. We designed and built our own leaf loader. Public Works, 96(6):133, June 1965.

A Clark-Lynn leaf loader is described which was used to cut total leaf collection time in half in Mooresville, North Carolina. Advantages considered are that the vehicle operator had positive control over the nozzle; the need to connect and disconnect a loader for each load was eliminated; and the workmen were readily visible to the driver. The leaf-loader design which was adopted makes use of a V-type, 4-cylinder, VH4D, 30-hp aircooled-Wisconsin engine for power. The unit is mounted on the right-front of the truck. Power is transmitted to the blower through the clutch and V belts. The suction unit, made by Carolina Blower Company, has a 30-in. diameter and heavy-duty steel plate casing. The impeller has six heavy-duty reinforced blades. The loader is mounted on an M-B packer body. The duck extends through the packer body and compactor blade, permitting large loads to be carried since the leaves can be compacted. The nozzle pivots about a horizontal axis and may be raised and hooked in a travel position above the pavement. Attaching the loader to the vehicle is not difficult and it is stored on a table with dolly wheels. It is locked into place by dropping two pins through matching holes in the pipes welded to the front chassis. The leaf pick-up is from the left front, the operator facing oncoming traffic and having a clear vision of traffic as well as a close-up view of the nozzle. The device is patented and several have been sold.

65-0633
Smith, W. H. Maggie modernizes Mishawaka's methods. American City, 80(6):124-125, June 1965.

A vacuum cleaner for leaf collection was purchased by the mayor of Mishawaka, Indiana. A schedule was publicized and citizens were asked to keep their cars off the street when their block fell due. For the first time, home owners were encouraged to rake the leaves into the gutter where the machine could collect them quickly. Flogging from leaf-clogged inlets disappeared. The air remained clear of smoke from smoldering leaves. Costs dropped to a fourth of the former value.

65-0634
Streamlining leaf removal operations. Public Works, 96(9):92, Sept. 1965.

An Ohio city uses a Vac-Master vacuum leaf machine that cuts time and cost of leaf removal. A grinding mechanism reduces the bulk of the leaves by about one third.

65-0635
Street cleaning and planting operations in San Francisco. Public Works, 96(6):92, 94, June 1965.

The Bureau of Street Cleaning and Planting of the San Francisco Department of Public Works is responsible for the cleaning of 1,657 curb miles of streets and 109 curb miles of traffic islands. The Bureau is also charged with the maintenance of street trees and landscaping, and the landscaping of three sewage treatment plants and other areas, for a total of 7,300 trees and 232 acres of landscaping. During 1963 to 1964, the Bureau had 379 employees in two divisions and expended $3,081,226. The street cleaning division had 71 units of motorized equipment. The street cleaning division hauled over 100,000 cu yd of refuse to the sanitary fill dump during the year. The Bureau logged 20,054 radio calls over Public Works Station KME 327, of which 13,110 were originated by the Bureau of Street Cleaning and Planting. All emergencies reported to or observed by the Department can be acted on immediately. Two years ago, gang sweeping in the south of Market area was eliminated and a night mechanical sweeper was substituted, but gang sweeping was later re-activated because of the increasing number of complaints from the public. In order to clean this area properly, both methods of cleaning were found necessary.

65-0636
Sunquist, S. Street cleansing and snow clearance in Stockholm. APWA [American Public Works Association] Reporter, 32(2):12, 16-17, Feb. 1965.

In Stockholm, streets are cleaned by both machine and hand daily on a rotating basis by limiting parking. In winter Stockholm has a contract for 24 hr weather forecasts with extra reports for sudden changes. A gritting organization, with 13 one-man trucks are on around-the clock-basis from November 1 to April 1, each assigned a specific district. If conditions worsen, 29 city and 51 private trucks are leased. They hold 2.2 cu m of grit which is spread in front of the driving wheels. This gritting operation is controlled by the driver. Tests show that the most economic sand is 3 to 4 percent salt by weight. Salt must be examined as it may damage vegetation, concrete, or animals; 10 percent salt by weight is used on thin ice coatings and pure salt on steep slopes. Stockholm uses straight or rock salt at the start of snowfall and places boxes of sand and salt mixture throughout the city. Winter snowfall averages 100 cm. For fast street snow removal, the Stockholm Cleansing Department uses supplement equipment and drivers, which keeps capital and garage space at a minimum. Because of traffic conditions most snow is put into piles equivalent to two parking spaces.

It is then usually dumped into the sea. Total equipment used last year was 100 plows, 80 gritting and 200 hauling trucks, 170 tractors, 90 graders, and 200 loading machines.

65-0637
Untouchables strike in New Delhi, India. Refuse Removal Journal, 8(3):28, Mar. 1965.

Eight thousand untouchables who work as street sweepers in New Delhi, India, went on strike. An untouchable is the lowest rung in India's ancient caste system, and it is unthinkable that they would attack the order of things. Most of the sweepers dropped their short broom of bound twigs to support demands for higher pay and better uniforms. The average laborer earns the equivalent of $10 per month. When work stopped, refuse began to accumulate in the streets, and striking sweepers hauled litter into the streets to help their cause. Roving bands of sweepers attacked non-strikers. The New Delhi Municipal Workers' Union supported the strike. The government declared sweeping an 'essential service' protected by law, and arrested 24 strike leaders under the Defense of India Rules, in an effort to get the men back to work. The sweepers continued to fight, six going on a hunger strike, while refuse mounted in the streets. Finally city officials agreed to discuss the demands, and work was resumed.

65-0638
Woodward, R. C. Why wire? Public Cleansing, 55(10):571-574, Oct. 1965.

Recent advances in street cleaning brushes, with particular emphasis on wire brushes are described. In sweeping efficiency tests, wire brushes out-performed natural fibers. In economy tests, wire cost $0.09 per mile swept compared to $0.18 per mile for natural fibers. Steel brushes require greater emphasis on proper brush pressure and adjustment to realize greater economy. Wire brush life is about 500 to 1,000 miles compared with 50 to 100 for natural fibers. Relative costs and mileages of various natural, synthetic, and crimped-wire brushes are compared.

EDUCATION AND RESEARCH

65-0639
Bell, J. M., and E. A. Glysson. Academic education and training in solid wastes. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.W-3 to W-28.

The information gathered from a questionnaire sent to 107 colleges and universities in the United States and Canada (from which 91 (85%) replies were received) showed that only 8 (9%) were presently conducting research on solid wastes and only 11 (13%) expect to start research in the near future. Only $134,000 was appropriated for research, most of it from the USPHS. Only 3 (3%) of the institutions were offering courses on solid wastes and 5 (6%) expect to. The comments made on the questionnaires with regard to the academic position of solid waste are given. The problems of keeping up with research developments, with innovations, and with economic changes are described. Questions about specific courses and the students taking them were answered. Some chemistry and physics majors have taken courses in solid waste disposal although most of the students are in engineering.

65-0640
Chappel, W. California school starts course on solid wastes. Refuse Removal Journal, 8(2):36, Feb. 1965.

The Engineering College of U.C.L.A. will inaugurate a 10-week seminar in Solid Waste Technology. The lecturers will be authorities in their respective fields.

65-0641
Comprehensive research needed for public cleansing service. Surveyor and Municipal Engineer, 125(3809):38-40, June 5, 1965.

In a paper entitled 'Specialization and Research in the Larger Units of Local Government', given at the annual conference of the Institute of Public Cleansing at Scarborough in June of 1965, R. I. Cooper noted the large sums spent on pure and applied research by industry, but that the cleansing industry which expends 87 million in England and Wales annually spends practically nothing on research. An example of the need for research is the refuse storage situation which has actually changed very little in the last century. The storage of putrescible refuse in dustbins or other containers for up to a week before collection is out of place in the space age. As alternatives to storage of putrescible refuse on the premise are: a water-borne system such as the Garchey System for transporting the refuse from the house to a collecting point. Progress in this field has been slow, but a research unit might accelerate the advancement of the method if it has merit. On-site refuse incineration is regarded as the obvious solution now that the smoke and odor problem has been solved. There are similar problems in the fields of disposal, work study, and street cleaning, which could be helped by suitable research. Of all the alternatives that have been considered, the most practical and the one which offers the most promise of immediate results is that of a research section within each large cleansing department. Units such as these could develop into regional research centers and hopefully into a national research center in time.

65-0642
Cooper, R. I. Discussion on ‘Specialization and research in the larger units of local government’. Public Cleansing, 55(8): 446-451, Aug. 1965.

The discussion brought out the need for knowing why there was a lack of regionalization and research, the possible assistance of universities in researching, the use of extensive research before regional disposal councils were set up, and highlighting of research and development which has been done by local departments.

65-0643
Current solid waste research projects. Journal of the Sanitary Engineering Division, American Society of Civil Engineers, 91(SA6):13-16, Dec. 1965.

Brief reviews of 15 current research projects on solid waste disposal subsidized or financed by Public Health Service grants are reported. Research is being conducted in the fields of sanitary landfill utilization, computer programming of refuse collection systems, pyrolysis of municipal refuse, incinerator residue, shipborne municipal incineration, continuous municipal incineration, composting fruit and vegetable refuse, livestock and farm waste studies, incineration of radioactive solid waste, and planning of a national solid waste management conference.

65-0644
Eldredge, R., and J. Vanderveld. Non-academic education and training. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.X-1 to X-25.

Non-academic education is specifically designed for the decision-makers and the doers. Decision makers are those who hold positions of administrative responsibility: mayors, city councilmen, public works directors, superintendents of sanitation. Planners and consulting engineers are ‘decision-makers’ and non-academic education may be as important to them as academic education. Doers, the men who do the operation, appreciate knowing the problems of decision-makers’ problems. It helps them realize the full responsibilities of their jobs. Demonstrations of such things as sanitary landfills, tours of well-operated landfills, short courses on specific subjects and correspondence courses, are among the means of non-academic education available. The problems of public education are discussed. In-service training is important and some examples extramural program, which involves support to individual investigators in universities or other institutions for non-directed research and is generally known as the research grants program. Research grants, often referred to as ‘non-directed’ research, are based on a research idea originally conceived by the investigator which is submitted to the Public Health Service for appraisal and possible support. Presently there are 15 active research projects in the solid wastes field supported by the division. Eight active grants dealing with municipal waste are concerned with: sanitary landfill, mathematical simulation of refuse collection and disposal systems, pyrolysis of municipal refuse, incinerator residue, systems analysis for shipborne municipal incineration, pyrolysis of solid municipal wastes, and continuous incineration of are given. Informing the worker of his part in the total scheme creates morale.

65-0645
$197,500 granted Harvard U. for incineration at sea. Refuse Removal Journal, 8(10):38, Oct. 1965.

The U.S. Public Health Service has awarded a $197,500 grant to Harvard University's School of Public Health for a two-year study of refuse incineration and disposal at sea.

65-0646
Public Health Service to give three solid waste courses. Refuse Removal Journal, 8(10):18, Oct. 1965.

The Public Health Service will offer three short training programs in solid waste technology: Solid Waste Orientation, Technical and Planning Aspects of Solid Wastes, and Survey of Solid Waste Service.

65-0647
Research Grant. Public Cleansing, 55(4):220, Apr. 1965.

Research grants totaling $100,000, have been awarded to British schools to study the processing of household and industrial wastes into utilizable and harmless products, and the use of microorganisms on preparing trade effluent, such as canning and other food wastes, for utilization or sanitary disposal.

65-0648
61 attend 10-week solid waste technology course at U.C.L.A. Refuse Removal Journal, 8(6):16, June 1965.

The Engineering Extension division of UCLA sponsored a 10-week lecture session in Solid Waste Technology. Sixty-one students enrolled in the course, which briefly covered all phases of solid waste collection and disposal.

65-0649
Steed, H. C. Research in solid waste engineering. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.Z-2 to Z-18.

The Division of Environmental Engineering and Food Protection provides consultative and technical assistance to state and local health departments, universities, and other agencies in planning and developing a program in the field of environmental engineering and food protection. The accomplishment of these programs requires: the identification and assessment of environmental problems, the development of control methods, and the application of knowledge obtained. The Division has two types of research activity: the intramural program, which is concerned with research usually conducted by the Public Health Service, and the municipal refuse. Six projects currently active related to industrial and farm solid wastes deal with canning operations in the food industry, agricultural wastes including animals waste problems, and vector control projects. The contract number, project manager, address, allocation, and a brief abstract of the projects are given.

65-0650
University course on solid wastes. American City, 80(1):107, Jan. 1965.

The University of West Virginia is offering a course on solid waste disposal as part of its air-pollution-control graduate training program. The program is supported by a training grant from Division of Air Pollution.

HEALTH AND SAFETY

65-0651
Arkansas State Department of Health. Proceedings; First Conference, Recreation Sanitation and Safety, Little Rock, May 25-26, 1965. Dallas, U.S. Public Health Service. 97 p.

The conference was sponsored by the Arkansas State Department of Health in cooperation with the U.S. Public Health Service. The objectives of the conference were to: develop an awareness within Arkansas of the environmental health aspects of planning, developing, operating, and maintaining outdoor recreation areas; to emphasize the role of the Arkansas State Department of Health in recreation sanitation and safety; and to unite the numerous aspects of the recreation environment that relate to both sanitation and safety. The papers presented covered such topics as: recreation safety in water sports, travel trailer parking areas, water supplies, sewage disposal, plumbing and heating, food sanitation, vector control, and refuse handling.

65-0652
Axtell, R. C. Comparative toxicities of insecticides to house fly (Musca domestica) larvae and Macrocheles muscaedomesticae, a predator of the house fly. In Integrated control of the house fly. Raleigh, North Carolina State University, Aug. 2, 1965. p.1-5.

The comparative toxicities of 17 insecticides to house fly larvae and a common manure-inhabiting macroshelid mite were determined. The LD/50's and LD/95's for the 17 insecticides were determined for third-instar larvae of the house fly and adult female Macrocheles muscaedomesticae, a predator on house fly eggs and larvae. The mites and fly larvae were exposed to the insecticides incorporated into fly rearing medium. Bayer 39007 (2-isopropoxyphenyl methylcarbamate), Ciodrin alpha-methylbenzl 3-hydroxycrotonate dimethyl phosphate), dimethoate and demetilan were more toxic to the mites than to the fly larvae. Kepone (decachlorooctahydro-1,3,4-metheno-2H-cyclobuta[c d]pentalen-2-one), lindane, coumaphos, ronnel and GC 9879 (alpha(diethoxyphosphinothioylthio) gamma-butyrolactone) were more toxic to the fly larvae than to the mites. The remaining chemicals which were about equally toxic to the fly larvae and the mites were: naled, dichlorovos, fenthion, malathion, trichlorfon, DDT, diazinon and chlordane. The development of selective insecticides is advocated in order to make possible an integrated house fly control program.

65-0653
Axtell, R. C. Integrated control of the house fly. Raleigh, North Carolina State University, Aug. 2, 1965.

In order to develop an integrated control program for the house fly, better knowledge of the behavior and insecticide-susceptibilities of the mite and insect enemies of the house fly is required. Results of investigations of the behavior and insecticide-susceptibilities of manure-inhabiting mites, which are predacious on the eggs and larvae of the house fly are reported. Research accomplishments are presented in the form of sub-projects. The complete manuscripts and reprints of these reports are included: Phoretic Relationship of Some Common Manure-inhabiting Macrochelidae (Acarina: Mesostigmata) to the House Fly; Predation by Fuscuropoda vegetans (Acarina: Uropodidae) on the House Fly (Musca domestica); Sensory Functions of the Palps and First Tarsi of Macrocheles Muscaedomesticae (Acarina: Macrochelidae), a Predator of the House Fly; Manure Substrate Effect on the Phoretic Behavior of Macrocheles Muscaedomesticae (Acarina: Macrochelidae); and Comparative Toxicities of Insecticides to House Fly (Musca Domestica) Larvae and Macrocheles Muscaedomesticae, a predator of the House Fly.

65-0654
Axtell, R. C., and D. J. Farish. Manure substrate effect on the phoretic behavior of Macrocheles muscaedomesticae (Acarina: Macrochelidae). In Integrated control of the house fly. Raleigh, North Carolina State University, Aug. 2, 1965. p.1-11.

Macrocheles muscaedomesticae (Scopoli) is a significant biological agent regulating house fly populations and along with other manure-inhabiting mites must be considered in the development of an integrated control program against the house fly. The mite was exposed to adult house flies in the presence of various substances. The frequency of phoretic attachment to the flies increased in the presence of manure (chicken and cow) of increasing age. Conversely, the detachment of the mites from their fly hosts decreased in frequency as the manure aged. The attractiveness of fresh manure was demonstrated, but could not be explained on the basis of ammonia vapors since the mites were not attracted to urea, ammonium nitrate and ammonium hydroxide in an olfactometer. An artificial fly rearing medium was not attractive to the mites and did not induce increased frequency of phoresy as it dried. The attractiveness of manure decreased upon drying but was restored with re-moistening. It was concluded that phoretic attachment takes place when the manure attractiveness is less than that of the flies and detachment occurs when the manure attractiveness exceeds that of the flies.

65-0655

Axtell, R. C. Phoretic relationship of some common manure-inhabiting macrochelidae (Acarina: Mesostigmata) to the house fly. In Integrated control of the house fly. Raleigh, North Carolina State University, Aug. †, 1965.

Several species of Macrochelidae (Acarina: Mesostigmata) commonly occur in domestic animal manure. These mites are predaceous on the eggs and first-instar larvae of the house fly, Musca domestica L., and cause substantial reductions in house fly production from manure. A series of experiments was conducted to determine which of the five common manure-inhabiting Macrochelidae are phoretic on house flies. House flies, Musca domestica (L.), were trapped from mite-infested dairy cattle manure and collected by net inside dairy barns. Macrocheles muscaedomesticae (Scopoli) and M. Subbadius (Berlese) were commonly found attached to the house flies. Although M. Medarius (Berlese), M. robustulus (Berlese) and Glyptholaspis confusa (Foa) were present in the manure, only one specimen of each of the first two species and none of the third were found attached to a house fly. In a comparison of the behavior of macrochelids from laboratory colonies, M. muscaedomesticae and M. subbadius were phoretic on the house fly and the other three species were not. As a prerequisite to possible manipulation of predaceous mite populations as a means of house fly control, additional data are needed on the role of Coleoptera and Diptera as carriers of macrochelids. (Reprint)

65-0656

Edwards, P. R. Salmonellosis--an expanding problem. In Proceedings; National Conference on Salmonellosis, Atlanta, Georgia, Mar. 11-13, 1964. Public Health Service Publication No. 1262. Washington, U.S. Government Printing Office, Mar. 1965. p.7-12.

Improved diagnosis and increased awareness of salmonella infections are partially responsible for the increased number of cases recognized; yet reporting of the actual incidence is still quite incomplete. Recognized types of salmonellosis have grown from 44 in 1934 to well over 800 at the present, and previously unrecognized serotypes have been appearing at the rate of 50 to 80 a year. The intensified search for the presence of salmonellae has led to their discovery in unsuspected environments, such as in the intestinal tract of some reptiles, and in foods of vegetable or marine origin. The contamination of foods of animal origin can be reduced by such practices as thorough cleaning of abattoirs and treatment of carcasses. Heating, acidification and heating, and alkalinization have been recommended for destruction of salmonellae in egg products. However, in investigations, the food responsible for infection could be identified in only 12 percent of the outbreaks, and it is not always the originally contaminated food that gives rise to infection. Almost half the outbreaks of salmonellosis occurred in hospitals. Whether or not the character of the hospital diet accounts for this high proportion should be investigated. Human carriers create a problem which might be alleviated by regular fecal examination of food handlers in hospitals and geriatric institutions. Finally, more positive action should be taken to eliminate salmonellae from animal feeds.

65-0657

Environmental health practice in recreational areas. Washington, U.S. Government Printing Office, 1965. 134 p.

All aspects of environmental health practices are discussed in reference to the planning, operation, and maintenance of recreational areas. Individual chapters deal with sewage disposal, refuse handling, and stable maintenance, while others touch on problems of solid waste handling and disposal for campgrounds, picnic areas, and restaurants. Explanations are included of types of sewage treatment and refuse disposal methods.

65-0658

Farish, D. J., and R. C. Axtell. Sensory functions of the palps and first tarsi of Macrocheles muscaedomisticae (Acarina:

Macrochelidae), a predator of the house fly. In Integrated control of the house fly. Raleigh, North Carolina State University, Aug. 2, 1965. p.1-10.

Macrocheles muscaedomesticae (Scopoli) is a manure-inhabiting mesostigmatid mite, predaceous on the eggs and first-instar of the house fly. It has generally been assumed that the first pair of legs of Macrochelidae perform sensory functions, but neither the function of the legs nor the palps has been established experimentally.

65-0659
Hosel, G. Waste disposal from the viewpoint of public health. In Refuse and waste disposal. Berlin, Druckhaus Lichterfeld GmbH, 1964. p. 1-21.

The historical relation between municipal sanitation and general health is reviewed. Municipal sanitation is one of the main concerns of the public health service. It was only in the 19th century that effective measures were initiated in this field. This was due mainly to scientific and technical progress, political and social changes, and introduction of a public health service. Collection and transport of refuse and final disposal of solid waste are discussed. Refuse may be utilized or may be disposed of by dumping, incineration, or composting.

65-0660
Klotter, H. Disinfection and devitalization of solid and liquid waste. In Refuse and waste disposal. Berlin, Druckhaus Lichterfeld GmbH, 1965.

Disinfection of waste, devitalization of waste, and parasite control are discussed. Sterilization of waste with chemicals, chlorine, chlorine dioxide, ozone, ethylene oxide, and other reagents are presented. Sterilization of waste by physical methods such as thermal waste treatment including incineration, UV irradiation, and electrolytic waste sterilization are discussed. The physical worm egg control methods, and the biological worm egg control methods are two methods of parasite control.

65-0661
LeSage, F. Trained personnel avoid hazards of industry. Refuse Removal Journal, 8(1):30, Jan. 1965.

The new compaction truck has its own peculiar hazards, which can be overcome by safety training programs including various types of emergency drills and good selection of personnel. To date there are no such programs and this lack accounts for the high rate of accidents.

65-0662
Nix, H. L., and C. J. Dudley. Community social analysis of Savannah-Chatham County. Series 1. Atlanta, Georgia Department of Public Health, May 1965. 51 p.

A community analysis of Savannah and Chatham County, viewing the community through the eyes of those who by virtue of their positions are in a position to know a great deal about their community, is presented. Regular interviews were held with twenty-seven positional and reputational leaders. In addition to the interviews, twenty-three of the respondents completed a questionnaire. The questions used in the study were designed to elicit information concerning the following: basic attitudes and values in the community; community efforts; community needs and problems; ratings of community services; areas of cooperation and opposition; community organizations; and community leadership. The information has been gathered in order to provide information, understanding and consultation to the sponsors of the Environmental Health Study which should result in more adequate implementation of acceptable environmental health recommendations.

65-0663
O'Donnell, A. E., and R. C. Axtell. Predation by Fuscuropoda vegetans (Acarina: Uropodidae) on the house fly (Musca domestica). In Integrated control of the house fly. Raleigh, North Carolina State University, Aug. 2, 1965.

Uropodid mites are generally considered to be fungus feeders. However, it has been reported that uropodid mites occurred frequently in samples of manure of dairy cattle and chickens collected from inside barns in New York State. A study was undertaken to compare the rates of predation on eggs and first-instar larvae of the house fly by deutonymphs and adults of both sexes of F. vegetans to predation by adult female M. muscaedomesticae. M. Muscaedomesticae used in the study were from mass cultures maintained on a cow manure substrate with house fly eggs added daily. F. vegetans were collected from chicken and cow manure 2 weeks prior to the initiation of the study and were maintained on cow manure and house fly eggs until used in the experiments. Both sexes of adult F. vegetans were found to be predaceous on the eggs and first-instar larvae of the house fly, although at a lower rate than adult female M. muscaedomesticae. The difference in predation between the sexes of F. vegetans was not significant. F. vegetans deutonymphs were predaceous on the eggs and first-instar larvae of the house fly but at a significantly lower rate than adult female M. muscaedomesticae. In the feeding preference test, M. muscaedomesticae fed more on the fly eggs than on the larvae, while the converse was true for F. vegetans. The data obtained in the experiments indicate that adults of F. vegetans are predators of the house fly but to a lesser extent than adult female M. muscaedomesticae. The predation by the two species ought to be complementary when they co-exist in manure. (Reprint)

65-0664

Overweight 55-gallon drum amputates fingers and toes. Refuse Removal Journal, 8(1):24. Jan. 1965.

The 55-gal refuse drum accounts for numerous types of injuries to sanitation laborers as well as increasing collection operating costs in Amarillo, Texas. Forty-four thousand of the 61,200 trash receptacles are the 55-gal drums.

65-0665

Perlstein, J. Pictorial keys to common domestic flies in California. California Vector Views, 12(5):21-24, May 1965.

A pictorial key with explanations to aid in identifying common domestic flies and their larvae particular to California is presented. Correct identification of pest species is the first step towards managing control. The mere presence of adult flies at a suspected breeding place, disposal area etc., without identification of their larvae is inconclusive. The use of the pictorial keys and the preservation of specimens is briefly explained.

65-0666

Proceedings; National Conference on Salmonellosis, Atlanta, Ga., Mar. 11-13, 1965. Public Health Service Publication No. 1262. Washington, U.S. Government Printing Office, Mar. 1965. 217 p.

This booklet contains the proceedings of the National Conference on Salmonellosis which took place March 11 to 13, 1964, in Atlanta, Georgia. Over 200 representatives from State and Federal agencies, industry, and universities attended. This monograph includes the formal papers presented and the pertinent data reported during the several discussion sessions. The welcome address was given by Dr. David E. Price; Dr. James L. Goddard outlined the purposes of the conference. The topics discussed were: 'Delineation of the Problem,' 'Population at Risk,' 'Sources of Salmonella,' 'Interstate Outbreak of Salmonella Derby Gastroenteritis,' and 'Control of the Salmonella Problem.' The banquet which followed the conference was addressed by Dr. W. Charles Cockburn on 'Salmonella, Retrospect and Prospect.' A listing of conference participants and participating organizations is given.

65-0667

Protective clothing. Report of the Research Committee 1965. Institute of Public Cleansing, 1965. 6 p.

The purpose of the guide for protective clothing is to define suitable scales of issue for each kind of work and to recommend a specification for each item of equipment in order to simplify competitive tendering. The scales which are tabulated are offered more as a standard for comparison than a firm recommendation. The following matters should be taken into account when considering the provision of protective clothing for employees: expenditure on well designed clothing may be fully recovered as a result of improved health of the recipients; the expenditure may also be partly offset by the reduction or even elimination of working time lost; a good uniform may mitigate the recruiting difficulties which stem from the poor social status of public clenasing employees; the issue of clothing should be complemented by provision of lockers, drying room for wet clothes, and the washing, dry cleaning, and repair of all clothing at appropriate intervals. The Scales of Issue cover various types of employees such as inspectors, refuse collectors, drivers, refuse plant handlers, and tip men; the types of clothing needed including uniforms, footwear, and rainwear; and the normal period of use that can be expected. Relevant British Standard Specifications are listed.

65-0668

Safety is a saving. Refuse Removal Journal, 8(11):12, Nov. 1965.

Driver training, maintenance of equipment, and incentive programs increase truck safety record.

65-0669

70,000 flies per cubic foot of garbage. American City, 80(2):36, Feb. 1965.

A brief report on a Solid Wastes seminar in Niagara Falls, New York is presented. The talks touched on the propagation of flies in garbage, the growth of the volume of refuse, how a sanitary landfill should be operated, and the large amount of unsanitary open dumps in New York State.

65-0670

Sheppard, P. E. Accident rate highest for trash workers. Refuse Removal Journal, 8(8):26, 28, 56, Aug. 1965.

Sanitation workers have the highest accident rate for all industries, with a record of 72.39 disabling injuries per illion man hours. This and other startling facts and figures were brought to light in a recent survey conducted by the ational Safety Council and the American Public Works ssociation to determine the present status of safety programs and accident prevention efforts in the area of public employees. Questionnaires were mailed to 1,872 cities having 10,000 or more population, considering the basic questions of: does an accident problem exist? If so, how serious is it? What is being done and what can be done to meet the situation? Chart 1 summarizes accident experience divided according to population with an average of one out of every 16 workers suffering a disabling injury. In Chart 2, the Public Works injury record is compared with the National Safety Council's data on 41 major industries, showing definite room for improvement. Chart 3 summarizes the departmental accident rates. Chart 4 shows injury cost data, the average cost for workman's compensation protection, being $56.13 per employee per year. Compounded for all cities, this totals $87.001.500, which is only for one type of coverage. Additional costs are at least equal to the cost of insurance. Chart 5 shows the response received on the materials used in the safety program. Answers as to what is needed to help a safety program were: provision of literature, talks, films, posters, etc. for public employee operations; the development of training program guidelines for supervisors and employees; the provision of information on public employee safety programs and on accident case histories, analysis, and collect statistics.

65-0671

Slaughter of the rats. Public Cleansing, 55(5):275-277, May 1965.

A rat control experiment conducted at Tyseley, England, a refuse-disposal plant handling 1,000 tons per week on a $5\frac{1}{2}$ day basis is described. To prevent migration of the 4 to 5,000 rats when the plant was closed down for a short time, a quick-kill, single-dose poison was used. About 3,500 trays of Raticate Rat Killer were laid out in several hours at various points. The next day a large kill was observed, estimated at almost 3,000 or 60 to 75 percent of the rats, with about 3,000 bait trays being opened even though other food was available. Evidence proved that a rapid rate of kill was achieved, starting within two hours after the bait was laid. There was no danger to the operators, and birds could eat the bait with no adverse effects.

65-0672

Tips on flies on tips. Public Cleansing, 55(5):292-294, May 1965.

Discussion of an English Sanitation board held at Dudley is reviewed. Fly larvae were observed in dust separated from trash by screening before incineration, and to avoid this nuisance it was recommended that the dust be incinerated with the other refuse. Insecticides were dangerous and not completely effective on piles of unincinerated dust. Short comments on smoke, bonus schemes, and abandoned cars are also included.

65-0673
Weidner, H. House insect problems over the centuries. Staedtehygiene, 16(4):83-88, Apr. 1965.

A problem which could not be solved for centuries was the removal of wastes. All garbage, trash, and rubbish including excrements and animal carcasses were dumped into open sewers, running through the backyards of the houses, and very often simply into the streets which were mostly unpaved in those days. Beginning with the year 1560 all streets had been cleaned once every three months. Prisoners were assigned to do this job. In the 17th century a toilette emptying service was established, but life in the city continued to be everything else but sanitary. The cities bred flies by the millions and since the connection between deadly diseases and the occurrence of flies has been recognized only fairly recently, nothing much was done about them. With the improvement of the sanitary conditions in cities the flies disappeared, but only to concentrate on waste disposal sites. Here the same species have been found which formerly plagued the cities. But other insects such as locusts, cockroaches, and worms house in the waste pile too. The fermentation of the organic substances in the waste (sometimes constituting up to 37% of the entire waste) raises the temperature considerably above the air temperature; the prevailing humidity is constantly at 100 percent which makes it ideal, especially for locusts. But the real problem comes when they start to migrate at the end of June to nearby homes, to nibble at textiles and food and drive the residents to despair with their chirping, not to speak of the diseases these insects spread. To solve this problem completely the cities can only turn to incinerating waste. (Text-German)

65-0674
WHO Expert Committee. Environmental health aspects of metropolitan planning and development. World Health Organization Technical Report Series No. 297. Geneva, World Health Organization, 1965. p.5-66.

Among the subjects discussed are: the magnitude of the problem, planning for environmental health, the objectives of planning, the multi-purpose concept, the conservation of resources, and the need for social overhead capital. The problems in metropolitan planning are discussed and specific examples given from Russian experience. Water supply, waste disposal, drainage, solid wastes, and land pollution, and air pollution are among the specific problems of environmental health surveyed. The administrative and structural approaches are described. Finally, research needs are outlined and some suggestions made about training and education. The role of WHO in these matters is also emphasized.

LITTER

65-0675
The abominable litter man. Public Cleansing, 55(6):331-333, June 1965.

The 'Keep Britain Tidy Group' is behind the anti-litter campaign which has very limited effectiveness. Enforcement is the crux of any litter deterrent, and this is what is lacking both within the law and in any voluntary anti-litter organization. Educating the public and instilling community pride can be a hope for the future, but at the present there is an obvious lack of civic concern with too much dependence placed in governmental actions.

65-0676
Are your litter bins really necessary? Public Cleansing, 55(12):665-666, Dec. 1965.

This editorial poses questions as to whether the benefits of litter bins, in terms of street cleanliness, bear any relationship to the number of bins in a particular district. It suggests that other factors, such as popular litter consciousness, have a greater influence on street tidiness. It advocates a closer cost-effectiveness evaluation, taking into consideration original cost, clean-out and maintenance of bins as well as clean-up programs.

65-0677
Cincinnati wins clean-up contest. American City, 80(4):105-107, Apr. 1965.

Cincinnati, Ohio, won top honors in a national clean-up contest, sponsored annually by the National Clean Up - Paint

Up - Fix Up Bureau in Washington, D. C. Prizes were also awarded to the top three cities in eight different classes, divided according to population. The article describes the campaign of several contesting cities.

65-0678
Deasy, C. M. Landscaping and litter control. In American Public Works Association yearbook, 1965. Chicago, American Public Works Association. p.318-320.

'Beautifying' seeks to improve the physical aspects by minimizing those qualities that tend toward monotony or eliminating those that are chaotic, and bringing a sense of order and continuity to the whole. Landscaping is one of the best means of eliminating monotony. Methods used to encourage the use of plant materials include an annual 'Plant a Tree Week' promotion on Arbor Day. Similar methods of coaxing, educating, and cajoling can be applied to litter control. Litter control is a human problem, and it is necessary to change the mental attitudes of persons concerning their city. People do have some inhibitions about litter and their inhibitions must be increased by instilling a sense of community pride. The greatest effort is being concentrated on the young. Another objective is to facilitate the disposal of litter. Convenient and accessible litter containers are necessary. A litter bag should be in every car and a receptacle in every service station so the bags can be emptied, and a durable and attractive litter container should be on every street corner in commercial districts. While an attractive receptacle is to be preferred, the one essential quality is that it be immediately recognized as a litter container.

65-0679
The dirty face of a capital city. Public Cleansing, 55(12):686-687, Dec. 1965.

Sanitation conditions in Lima, Peru, where carelessness and lack of public spirit have generated large waste disposal and street cleaning problems. Rubbish and litter on roads and pavements, walls filled with grease and half-torn posters, broken-down motor vehicles exuding grease and oil, and filthy fruit stalls all contribute to an intolerable situation. A new City Cleanliness Campaign hopes to remedy this situation by engendering more public spirit among the people.

65-0680
Duba, J. G. Beautification of American cities-aided by urban renewal. In American Public Works Association Yearbook, 1965. Chicago, American Public Works Association. p.321-323.

The urban renewal program has done more to contribute to the beautification of American cities than any single program. Conceived in the National Housing Act of 1949, urban renewal was later expanded from slum clearance to include rehabilitation programs aimed at conserving aging neighborhoods and communities. Building code enforcement programs have been included. The elimination of slum and blighted areas has improved the appearance of cities and has eradicated conditions contributing to crime and social problems. The redevelopment of the cleared land has improved housing conditions, provided community facilities, increased the tax base, and generated employment. Proper planning of urban renewal projects can contribute to the beautification of cities, and examples are cited from Chicago's 33 approved projects. In new residential projects well-conceived landscaping with open space has been provided, shopping conveniently located, signs minimized, and utility lines placed underground. Older buildings have been painted, accumulated debris removed, and yards and parkways cared for. Commercial centers have been designed and developed to blend in with surrounding residential communities, and traffic problems have been alleviated. Adequate parking has been provided. The institutional development in Chicago, which has probably contributed as much if not more to the beautification of the city as any phase of urban renewal, is discussed.

65-0681
English roadside sanitary needs. Public Works, 96(10):72, 74, Oct. 1965.

An article by C. E. Waterfall in the Royal Society of Health Journal, July-August 1965, is reviewed. Somerset County, England, has been plagued by the inadequacy of sanitary facilities and the unsatisfactory state of roadside rest areas, all a potential public health risk. Littering is prohibited by law, although the Litter Act of 1958 is largely ineffective due to lack of enforcement. It is recommended that press, radio, and television campaigns against littering be renewed, that adequate litter receptacles be provided, that roadside rest areas be swept and maintained regularly, that local provisions be made for the disposal of large unwanted items, and that enforcement be stepped up. The need for toilet facilities is becoming acute, with a critical need for adequate signs so that available facilities will be recognized. All roadside toilets should have parking space. It is proposed that proper sanitary and service areas be built and, pending their completion, temporary conveniences be provided in pairs, on opposite sides of the road, at 20-mile intervals. The permanent facilities should have water and electricity and provisions for washing. If sewerage is lacking, septic tanks or prefabricated disposal plants should be installed.

65-0682
Litter large and small. Public Cleansing, 55(2):67, Feb. 1965.

The English Parliament's reluctance to interfere with municipal disposal of regular and also large waste articles such as old cars is described. It was felt that local authorities should make provision for disposal of cars and other bulky refuse brought to them, but not necessarily to canvass for such refuse. The availability of such services, well advertised, would lower illegal dumping of large refuse by residents.

65-0683
'Lively Louie' the talking litter basket. Public Cleansing, 55(10):580-582, Oct. 1965.

New York presently has 3 monitored litter baskets with loudspeakers which are controlled by operators with microphones working from hidden vantage points. The monitor encourages personally, in a pleasant way, pedestrians to be litter conscious.

65-0684
Pieces of debris whirl in space. Refuse Removal Journal, 8(10):37, Oct. 1965.

Scientists estimate that there are over 300 man-made objects whirling around in outer space. The Gemini-4 space voyage added to this total when Astronaut Edward White jettisoned some of his space gear. Howard P. Jensen, secretary of the National Council of Refuse Disposal Association, stated that, 'One of these days litter in space is going to create quite a problem, and somebody must think of a way to clean it up eventually, if we're going to use outer space extensively.' Among the space refuse are a floating mass of 400 million copper wires in a U.S. communication experiment, old rocket hulls, and stray parts of satellites.

MANAGEMENT OF SOLID WASTE SYSTEMS

65-0685
Association of Bay Area Governments, Bay Area regional planning program refuse disposal needs study. Berkeley, Calif., July 1965. 19 p.

The present and future situations, costs, regulations, and recommendations are summarized. Collection and disposal practices are discussed. Projected population growth, refuse volume, and disposal deficiencies from the basis for future regional needs, graphs, tables, and a map of disposal sites are provided.

65-0686
Association of Bay Area Governments, Bay Area regional planning program refuse disposal needs study; Supplemental report. Berkeley, Calif., July 1965. 120 p.

The terms used in this supplemental report are defined. Disposal methods currently used are described. Past reports which pertained to refuse disposal in the San Francisco Bay rea are summarized. The collection and disposal practices of each county are given. Tabular data is included.

Sections of the California Health and Safety code pertaining to refuse collection and disposal are summarized.

65-0687

Association of Bay Area Governments. Alameda County. In Bay area regional planning program disposal needs study-supplemental report. Berkeley, Calif. July 1965. p.21-33.

All disposal sites in Alameda County are required to be operated as sanitary landfills. Most refuse is collected by private firms under contract or franchise with the individual cities. Existing disposal volume in the thirteen existing sites will have been exhausted by 1981. Residential collection is once or twice weekly. Residential rates range from $1.20 to $1.62 per cu yd. Fill and cover is the most commonly used garbage is cooked for hog feed. Data is given on the collector, residential rate, refuse type, refuse site, number of vehicles, refuse tonnage—present and projected, and capacities of existing sites.

65-0688

Association of Bay Area Governments. Contra Costa County. Bay area regional planning program disposal needs study-supplemental report. Berkeley, Calif. July 1965. p.34-45.

The county does not issue franchises or establish collection areas. Disposal sites may be located only in heavy industrial districts. There are four major sites; all are fill-and-cover sanitary landfills. The existing volume will have been utilized by 1982. By the year 2000, the county will be producing 975,000 tons or 1425 acre ft of refuse annually. Residential refuse is collected weekly; fees range from $1.30 to $2.00 per month. Commercial refuse collection is arranged. Cover material for the landfills is obtained from the site. Salvaging is practiced at three sites. Data on area population, collector, residential rate, refuse type, disposal site, vehicles used, site capacity, and projected refuse production is given.

65-0689

Association of Bay Area Governments. Marin County. In Bay area regional planning program disposal needs study-supplemental report. Berkeley, Calif. July 1965. p.46-57.

Most refuse in Marin County is collected by thirteen private collection services. About 95 percent of the people in the County are provided with garbage collection service. Residential refuse is collected once or twice weekly at a fee ranging from $1.35 to $2.50 per month. There are five major disposal sites, four of which are privately owned. All are fill-and-cover sanitary landfills. Three sites accept only rubbish and demolition material. In 1963 there was a daily per capita refuse production of 3.8 lb. This statistic does not account for individual disposal or some industrial waste. The existing 8,300 acre ft in the present sites will have been fully utilized by 1989. Data is given on urban area population, collector, collection rate, disposal area, hauling distance, type of refuse, landfill type, landfill owner, estimated annual tonnage of refuse, projected solid waste production, and capacity of existing disposal sites.

65-0690

Association of Bay Area Governments. Napa County. In Bay area regional planning program disposal needs study-supplemental report. Berkeley, Calif. July 1965. p.58-66.

Six private agencies collect all the refuse in the county. Residential refuse is collected weekly at a fee ranging from $1.00 to $200 per month. Four disposal sites are operated by institutions, two, by private companies, and one, by the County. The County Health Department is negotiating to have the four institution sites county-operated or converted to sanitary landfills like the other three. Some burning is done at each site. Cut-and-fill or area-fill methods are used. Some salvaging is practiced. Per capita refuse production was 1.8 lb daily in 1963. When municipal, agricultural, and industrial wastes are added to the garbage tonnage, the total waste material amounts to 98,000 tons or 7.6 lb per capita per day. There is approximately 86 acres of land available for disposal use. Assuming no burning is done, this land will be sufficient until 1973. Tabular data is given on urban area populator, collector, fee, disposal area, refuse type, vehicles used, landfill type and owner, site capacity and remaining life, and projected solid waste production.

65-0691
Association of Bay Area Governments. City and county of San Francisco. In Bay area regional planning program disposal needs study-supplemental report. Berkeley, Calif. July 1965. p.67-69.

Refuse collectors must have permits issued by the Health Department. One private agency collects from residential areas and the other covers downtons. Weekly residential backyard carry service is provided at $1.25 to $1.30 per month. Commercial refuse is collected daily. The refuse collected is disposed at a sanitary landfill near Brisbane. A privately-owned site in the city accepts only rubbish, demolition, and construction material. During 1963 refuse production was 750,000 tons. This volume represents a daily per capita production of 5.5 lb. Tabular data on projected solid waste production is included.

65-0692
Association of Bay Area Governments. San Mateo County. In Bay area regional planning program disposal needs study-supplemental report. Berkeley, Calif. July 1965. p.70-84.

Eight companies collect refuse in San Mateo County. Residential collection rates range from $1.25 to $1.72 per month for weekly collection. Approximately 98 percent of the population subscribe to collection service. The average one-way haul to disposal site is 1 to 8 miles. Five of fourteen disposal sites in the county are publicly owned. Thirteen sites operate as sanitary landfills, utilizing fill-and-cover or cut-and-cover methods. Garbage is accepted at only eight sites. A landfill near Brisbane is used for San Francisco's wastes. Daily per capita refuse production is 4.4 lb. The present 18,290 acre ft available in the existing sites will be fully utilized by 1978. Tabular data is given on urban area population, collector, fee, disposal site, average haul, type of refuse, vehicles used, landfill type, estimated annual refuse tonnage, available land, and site capacities.

65-0693
Association of Bay Area Governments. Santa Clara County. In Bay area regional planning program disposal needs study-supplemental report. Berkeley, Calif. July 1965. p.84-98.

A county permit is required of all collectors within Santa Clara County. Thirteen companies collect refuse. City refuse is collected by private companies. Residential refuse collection is provided weekly at a fee ranging from $0.95 to $1.80 per month. There are sixteen disposal sites, six of which do not accept garbage. The regular disposal sites utilize the sanitary landfill (cut-and-cover or fill-and-cover) methods of disposal. Average haul distance to a site is 8.5 miles. Ten sites are privately owned, and four others are privately operated. Salvaging is practiced at some sites. Daily per capita refuse production is 3.3 lb. This figure does not take cannery or agricultural wastes into account. The 19,160 acre ft now available in existing sites will be fully utilized by 1979. Tabular data is included on: urban area population, collectors, fees, disposal sites, haul distance, refuse types, vehicles used, refuse tonnage, disposal area remaining, capacity and life of landfills and projected solid waste production.

65-0694
Association of Bay Area Governments. Solano County. In Bay area regional planning program disposal needs study-supplemental report. Berkeley, Calif. July 1965. p.9 -108.

A county ordinance provides for: issuance of permits to collectors and disposal site operators, minimum of weekly pickup, mandatory subscription to collection service, and refuse disposal by sanitary landfill only. There are seven private collection agencies in Solano County. Only the city of Dixon operates a municipal collection service. The basic residential monthly fee is either $1.25 or $1.50. There are disposal sites, all of which are landfills, utilizing the cut-and-cover or fill-and cover methods. Per capita refuse production which is disposed in county sites is 1.8 lb per day. Adding cannery and agricultural wastes plus sewage sludge increases the per capita production to 4.7 lb per day. Between 1963 and 2000, a refuse volume of 8,650,000 tons or 12,600 acre ft of refuse will be produced.

There are only 1000 acre ft of existing disposal volume. Tabular data is included on refuse collection, fees, haul distance, type of refuse, disposal sites, vehicles used, refuse tonnage, and type of landfill for the various urban areas. Charts show capacity of sites and projected solid wastes production.

65-0695
Association of Bay Area Governments. Sonoma County. In Bay area regional planning program disposal needs study-supplemental report. Berkeley, Calif. July 1965. p.109-118.

Sonoma County is served by nine private collection agencies who charge fees ranging from $.75 to $1.50 per month. Residential refuse is collected weekly. There are eight disposal sites, seven of which are county-operated. Three sites utilize a cut-and-cover operation in conjunction with burning. The other five are open dumps with burning. Average one-way haul distance is 9 miles. Refuse disposal at the sites averaged 3.9 lb per capita per day in 1963. The 1250 acre ft in the existing sites is sufficient to last to the year 1970. More detailed data on collection, fees, haul distance, disposal site and vehicles used is given in tabular form. Information is included on capacity of existing sites and projected solid waste production.

65-0696
Be alert for changes to increase efficiency. Refuse Removal Journal, 8(10):22, Oct. 1965.

The need for refuse executives to periodically check their business or department to reveal unnoticed and significant changes in service needs is emphasized. Key factors controlling operating costs, such as scope of service, material collected, collection frequency, collection point, collection regularity, population density, storage requirements, disposal method, disposal point distance, labor situation, and climate and terrain are reviewed. Systems analysis to stimulate progress, as well as more research, including consistent knowledge of refuse volume and seasonal variations, a nationwide development of uniform standards of measurement and analysis, and uniform cost accounting practices to aid in evaluation and comparison are urged.

65-0697
Beckman, N. Local versus areawide public works services. In American Public Works Association Yearbook, 1965. Chicago, American Public Works Association. p.327-335.

The Advisory Commission on Intergovernmental Relations undertook a study to find out which specific urban functions are most appropriately performed on an areawide basis and which might be better performed by individual local governments. The Commission's report, 'Performance of Urban Functions' describes each of 15 major urban services provided by government and some of the major considerations involved in administering them effectively. Water and sewage service can be provided at a lower unit cost on an areawide basis. There is some spillover of cost from refuse disposal, most commonly where cities dispose of their refuse outside their boundaries and provide proper operation of the disposal site. Economics accrue in operation of dumps and in refuse pickup, but the latter economies are limited by the increased cost of hauling refuse longer distances, although transfer stations modify the limitations. The economy of having a few large incinerators instead of many small ones, and the desire of residential suburbs to exclude community incinerators, make it desirable to enlarge the administrative area for the refuse disposal function.

65-0698
Beyond the parish pump. Public Cleansing, 55(12):672-673, Dec. 1965.

Progress of the North East British Cleansing Institute in organizing regional planning committees is reported. How labor shortages are aiding efficiency, development, and equipment use are explained.

65-0699
Bremser, L. W., H. T. Merwin, and P. M. Reid. Planning (Panel). In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.O-1 to O-13.

The background of the planning commission is traced, and a study conducted to solve the problem of sanitary landfill sites is discussed. Studies on economics, population, inventories on transportation, land uses and other areas necessary for developing a comprehensive plan for the region were conducted. Elements of the study include: determination of the source and quantity of all refuse produced in Franklin County, Ohio; investigation of present collection, geographical load sources and disposal methods and vehicles; estimation of county population growth for the next 20 years; estimation of the future refuse production of each load center; tabulation of the present and future average daily refuse tonnage produced by each load center; investigation of possible landfill sites, determination of the number, size, and location of disposal plants for a county operated solid waste disposal program, and estimation of the capital investment required and the owning and operating cost of this county operated disposal plant. The latter was part of phase one to be completed in 6 months. Phase two will require a maximum of 12 months and will include: the preparation of specifications and general layout drawing on long term delivery items; such as incinerator assisting the Board in soliciting bids; and the preparation of detailed working drawings and specifications for disposal system facilities. Phase three, to take 21 months, will provide construction supervision in getting the program underway. Necessary facts in master plans include: the quality, character, and location of the origin of solid wastes in the community, character of the population, and character of commerce of manufacturing. Other points of consideration are the reuse of sanitary landfill areas for recreation, for open space, etc.

65-0700

California waste management study--a report to the State of California Department of Public Health. Azusa, Calif. Aerojet-General Corporation, Aug. 1965. 411 p.

California's waste disposal problem adversely affects its environment, health, and economic development. No single organization deals with this increasingly complex problem. The Study's purposes are to enable the state to: project and consider the future; define waste management's major elements; determine the feasibility of system analysis and engineering; and establish studies, research, and developmental activities. It concerns itself with output (environment desired) rather than disposal of inputs (waste). Waste management handling and prevention is focused upon. Boundaries of political entities are not considered; significant airborne and liquid waste movement areas are examined; projected generation rates and cost estimates are made, and utility of regional models evaluated, and a developmental plan formulated to delineate the sequence of activities required in developing a regional waste management system. The study concluded that system analysis and engineering must be employed to establish a system that will be economically and aesthetically effective besides preserving plant, marine, animal, and mineral resources. The following program is recommended: obtain critical data and specify assumptions for employing proper environmental and socioeconomic models; catalog relevant community objectives; evaluate all major technical alternatives; complete the overall analytical computer models to represent and measure all main actions. It was recommended that a socioeconomic model be constructed with a scaled operating model, using the most promising waste handling techniques. Initial component specifications should be established, as well as guidelines for subsequent research and development. A State Coordinator should be designated to assume the necessary planning, coordinating, and supervisory functions. Illustrations and data considers all aspects of the report.

65-0701

Chapman, J. S. Epidemiology of solid wastes. In Proceedings; Seminar on Regional and Municipal Environmental Planning, Dallas, Jan. 7-8, 1965. U.S. Public Health Service. p.65-67.

The history of solid wastes as seen through archeology and anthropology is reviewed. Essentially wastes can be pulverized, compacted, converted to another state, or simply dumped. The primary and basic law regarding solid wastes, merely resolves itself into the fact, that the community must finally assume its responsibility and determine the most appropriate solution to the problem.

65-0702

Cochran, D. M. Solid waste discussion. In Proceedings; Seminar on Regional and Municipal Environmental Planning, Dallas, Jan. 7-8, 1965. U.S. Public Health Service. p.55-59.

Due to the broad open spaces of Texas, the problem of refuse disposal has not been as pressing as it is in the more populated states. The cities of Texas, in general, provide fairly well for the collection of refuse. However, complaints from citizens concerning problems related to refuse are on the increase. Some cities are operating refuse programs by methods which are no longer efficient and are not in the interest of good health. Reasons for this mismanagement include lack of knowledge, lack of funds, and the absence of authorities on the subject to provide advice. A brief review is given of some of the fundamentals of refuse sanitation including: kind, composition, and source of refuse; pollution problems; aesthetics and vector control; storage containers; collection processes; and methods of disposal. The most commonly used satisfactory method of disposal, the sanitary landfill, is discussed at length. Planning in all aspects of municipal refuse handling is emphasized.

65-0703

County problems. Public Cleansing, 55(12): 694-697, Dec. 1965.

A discussion of a paper on British county refuse disposal is presented (see item 135-A). Voluntary regionalization of refuse disposal service would not progress as fast as that aided by changes in local governments and economic pressures. Mobile mechanical methods were proposed for rural use. A tip attendant was feasible only at a central tip, and this would also allow tipping of special refuse by citizens instead of dumping at vacant lots. Responsibility of the refuse disposal officer to accept all forms of refuse was emphasized.

65-0704

An editorial. Refuse Removal Journal, 8(6):14, June 1965.

Well maintained equipment, courteous employees, acceptable disposal operations, and neat headquarters contribute to good public relations and high morale among employer and employees. Continuous self-improvement is the capsule requirement for projecting a good public image.

65-0705

Editorial reflections--public relations. Public Cleansing, 55(4):178-181, Apr. 1965.

Several of the challenges in the solid waste field in the modern cities are discussed. Cooperation with planners and architects, increased vehicular problems in street cleaning, and obtaining adequate finances for a less than glorious service were all cited problems. Increased news and feature coverage to let the public know the achievements and services of the sanitation departments, as well as the now well publicized criticisms are encouraged.

65-0706

Fleming, J. R. Environmental management - a twentieth century public health challenge. Canadian Journal of Public Health, 56(1):1-6, Jan. 1965.

Scientific and technological advances have exceeded our social, economic, and political capacity to fully apply this knowledge. The environmental scientist is now facing such problems as mushrooming cities, increasing complexity of water problems and demands, mounting pollution of the atmosphere, and awareness of the need to maintain a balance of the chemical and biological forces in our environment. In the last ten years the fringe area population growth, which was six times that of the core city, occurred in unprepared suburbs and in crowded, poorly prepared communities. The planning required by population growth may be realized when it is appreciated that every 1,000-person increase in population will require an additional 100,000 gal of water a day and will produce 68,000 lb of non-industrial air pollutants a month, 365 million gal of liquid wastes a year, and 750,000 lb of refuse annually. The air, water, food, and urban environments are reviewed in terms of the necessity of accepting the philosophy of compromise and calculated risk, in which the advantages and disadvantages are balanced, rather than the concept of safe or unsafe. Control of environmental conditions to allow man's existance is not enough; environmental management should be directed toward the maintenance of environments suitable for man's needs and desires. The leadership in the rapidly developing field of environmental management should be a challenge to the public health sanitarian and others in the public health field.

65-0707

Garbage and refuse disposal authorities. Public Works, 96(3):144, 146, Mar. 1965.

The incorporation of several communities into an authority for the sole purpose of providing facilities for the disposal of refuse offers an excellent solution to a difficult problem. The judicious selection of participating members simplifies long range planning, lowers service costs to a minimum, and allows cities to take broader collective action. Incinerator plants can be designed to serve future needs as well as present-day requirements. The articles of incorporation drawn up and adopted by the respective legislative bodies empower the legislative bodies to levy taxes to pay the costs to the authority. The authority in turn can issue self-liquidating revenue bonds, for the purpose of acquiring, improving, enlarging or extending facilities for the collection of garbage and refuse. Five authorities have been established in the Detroit Metropolitan Area since 1947. One of these, the Southeastern Oakland County Incinerator Authority, consisting of fourteen communities north of the city limits of Detroit, was created in 1951. This authority constructed a 450-ton incinerator plant in 1954 with a subsequent increase in capacity to 600 tons in 1964. The formation of this authority and the legal, engineering, and economic studies necessary to bring about this joint community effort for garbage and refuse disposal are discussed.

65-0708

Garrett, R. Refuse reflections. Public Works, 96(10):79, Oct. 1965.

The problem of refuse disposal is one that crosses city, county, and state boundaries. As our population expands, the condition becomes more acute. There is a definite need for a central group of experts to standardize and give direction to the reduction and elimination of the hazards involved in refuse disposal. Such a committee could assemble complete information on all the methods of refuse disposal in use, make a thorough analysis and evaluation of each and then issue specific recommendations. The emphasis should be placed on determining the best means available for refuse disposal and research should be developed to find new and better methods. At present, a community has these alternatives for refuse disposal: controlled, open-burning dumps; sanitary landfills; composting facilities; or incineration plants. Selecting one or a combination of these methods poses a formidable problem to local officials as they need a recognized central source of information to assist them. The refuse disposal problem is directly related to increasing population, higher living standards and the trend toward total packaging of all consumer products. As the volume of solid wastes will continue to grow, sound solutions for handling them are needed.

65-0709

Gilbertson, W. E. Solid waste discussion. In Proceedings; Seminar on Regional and Municipal Environmental Planning, Dallas, Jan. 7-8, 1965. U.S. Public Health Service. p.51-54.

Close to one-half of the total amount spent for solid waste handling, treating, and disposal, actually is expended through private enterprise. It is estimated that the annual expenditure in the private sanitation industry is over $1.3 billion. The reason is that a large part of this private enterprise aspect relates to industrial operation. In Texas, large amounts of solid waste are generated by the stock and animal feeding yards, poultry dressing, and food processing plants. Although this private enterprise is something like a public utility, none of the standards of performance or guarantees of continuity of service surround this field. Other problems involve public relations with regard to location of sanitary landfills, incinerators, and transfer stations as well as routing of collection vehicles through residential areas. It is emphasized that more attention should be given to solid waste problems by the professions, and local, State, and federal governments.

65-0710

Hessing, F. Refuse and waste disposal and regional planning. In Refuse and waste disposal. Berlin, Druckhaus Lichterfeld GmbH, 1964.

The relation between regional planning and disposal of solid waste is considered from the angle of planning legislation. Irrespective of whether regional planning policy is applied on the federal, State or municipal level, it must not and cannot be expected to deal with waste disposal. In describing the position of waste disposal in the present regional condition, conflicts are mainly due to: the land requirements for waste disposal, the waste disposal arrangements serving individual municipalities. The regional planning legislation in its importance for waste disposal must be presented at the federal level, the State level, the district level, and the municipal level. The importance of structural policy in large areas is also discussed.

65-0711

Hope, M. Solid wastes and tomorrow. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.Y-1 to Y-10.

Developments in the field of solid waste are traced. Federal assistance will be forthcoming and President Johnson specifically recommended a program of technical assistance to the states and a program of research and demonstration. Innovations are being made in some areas but little progress in others. The waste production in the United States is increasing on a per capita basis at the rate of 4 percent per year. Estimates are made of waste production for the San Francisco Bay area and for Chicago. Solid waste disposal activities in the United States cost $3 billion per year, or a per capita charge of $15 for each man, woman, and child in the United States. The problem is one of lethargy. Although modern building materials are available to rehabilitate slums, nothing has been done about solid waste disposal. Professional manpower is needed. The path of the Solid Waste Act through Congress with its revisions is described. This act provides a national program of research and development, including the conservation of resources and the utilization of potential resources in solid waste, with technical and financial assistance to states, to local governments, and to interstate agencies. Section 203 defines the Department of Interior as the federal agency concerned with the problems of solid waste generated in connection with the extraction and processing of minerals and fossil fuels. Section 204 provides for support of research, demonstration, and training. Section 205 relates to the problems of interstate and regional cooperation, and to state and interstate planning grants. This bill authorizes $7 million for the first year, $14 million for the second, and for the third and fourth years, $19 and 20 million, respectively.

65-0712

James, J. A. Financial aspects of refuse programs. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health, p.S-2 to S-14.

Fiscal planning is concerned with the means or money to finance a governmental operation such as solid waste collection and disposal. Expenditure planning or programming is concerned with the development, execution and appraisal of the operation. Revenue and expenditure planning and programming for refuse activities have common characteristics of: a direct effect upon other municipal programs continuous operations; communication not only internally but externally to the various publics and jurisdictions, and law. A legal basis in the area of revenue should be found. Criteria for determining an equitable tax or a good revenue source should relate to a value system and include: administration, yield, and concepts of equity. Characteristics of local government revenue source should relate to a value system and include: taxes or levies which are regressive in nature or at best proportional, exclusion or exemption of certain classes of taxpayers or properties from the levy, the fear of citizen resistance to any new revenue measure, and reliance upon service fees and charges to finance local expenditure programs. More and more jurisdictions are developing heterogeneous tax structures. Means for financing solid waste collection and disposal include: general taxation and user charges. The levy on real property is still the backbone of local tax programs. The administration of the real property tax involves assessment, collection, and enforcement. Tax exemptions, exclusions, and rate limitations also exist for non-property taxes. The use of fees and charges raises the problem of whether the service confers a benefit on all members of the community, and whether the service should be subsidized. The policy issues of municipal indebtedness are listed.

65-0713

Johnston, P. County problems. Public Cleansing, 55(11):652-657, Nov. 1965.

Problems involved in British county and rural refuse disposal services are discussed. Administration is generally by an officer with other responsibilities and would be improved if a specialized cleaning officer was employed in a region large enough to occupy his full efforts. Regionalization would improve and mechanize disposal services. Lack of control, unauthorized dumping, fire, vermin, and danger to children and workers characterizes many small rural tip sites. Disposal of carcasses from cats, cows, sheep, swine, and whales requires special procedure. Large marine carcasses must be reported to national agencies, and livestock carcasses inspected for disease before disposal. Trade refuse from chicken preparation, chicken hatcheries, and bakeries all pose special problems, as do special waste from farms. County refuse disposal problems differ only in degree from city problems.

65-0714

Master refuse planning. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.N-1 to N-14.

A master refuse plan is a comprehensive plan for dealing with refuse from its source to its final disposal. It must be based on facts developed from engineering analysis. Generally, the refuse problem may be classified into three phases: collection, haul, and disposal. The type of refuse collected has a definite effect on the method of disposal, the hours of collection, and the cost of haul. The total expenditure in the United States for refuse collection and disposal is from two-thirds of a billion to $2 billion annually. Accurate basic data for planning and reliable design criteria for refuse facilities are lacking. A few years ago, the major portion of refuse was waste food products or garbage, but now, with frozen, packaged, and canned foods and with increased use of home garbage grinders, kitchen refuse has become largely the package in which foods are sold. Major factors in collection are the frequency and scope of service provided. Commercial refuse is usually collected in a manner similar to residential refuse, except that frequency must be adjusted to suit the need. Industrial refuse is usually collected and disposed of by a private contractor. The history of refuse collection is traced. Technically, composting is feasible but a commercially successful operating installation in the United States has not yet been achieved. The population migration toward urban areas and the consequent increased hauling distance to disposal sites is noted. Contract refuse operations and the role of politics are discussed. Elements to be considered in planning are listed.

65-0715

Mossey, E. A. Metropolitan approach to refuse disposal. Public Cleansing, 55(5):313, May 1965.

Reasons for the past adoption of a regional approach to refuse disposal in London and the surrounding areas, and the expected results of this adoption are described. A history of waste collection in London from the 14th century to the present is given. As early as 1666 the city recognized a need for central agency control of refuse, but the programs attempted were unsatisfactory. In 1929 a researched recommendation for central responsibility for refuse service was defeated. In 1951 a Royal Commission was created to examine local governments in London and make recommendations. Extracts from the Commission report concerning refuse collection are included. The commission found criss-crossing and overlapping of disposal routes of different councils, lack of coordination of transfer points, high costs, lack of research, and inability to concentrate labor forces at particular times on problem areas, such as thoroughfare street cleaning. The formation of the Greater London Council will replace 87 separate councils with 33 councils all under one authority. This will facilitate obtaining land for central disposal, direction on land reclamation, reduction of transport costs, and establishment of a research center.

65-0716

Overman, S. M. Review of federal and state legislation. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.Q-1 to Q-9.

There is very little Federal legislation dealing specifically with community solid wastes. No Federal legislation assists states in developing comprehensive programs for handling and disposal of solid wastes or authorizing research and demonstration projects leading to more effective disposal. A number of bills have been introduced in the Federal Congress but none has become law. One bill now pending which has been passed by the Senate is the 'Solid Waste Disposal Act' Title II, S. 306, which amends the Clean Air Act. The responsibility for the administration of the program is vested in the Department of Health, Education, and Welfare, with some exceptions. Eligibility for grants under the program is discussed, as are specific monetary authorizations. There is little published about the extent of state legislative authority to conduct state level programs of solid waste control, although a questionnaire by the Public Health Service has indicated that legal authority is based upon general health or nuisance laws for controlling wastes. There is a need for basic legal authority and a legislative mandate for the appropriate state agency to conduct an active solid waste program. Governmental authority in Ohio is vested in municipalities, counties, and townships. The various rights authorized to a municipal corporation and to counties in Ohio with respect to solid waste activities are listed. The special sanitary district is discussed. Municipalities in most states and other political subdivisions in some states have authority to conduct solid waste operations.

65-0717

Proceedings; Seminar on Regional and Municipal Environmental Planning, Dallas, Jan. 7-8, 1965. U.S. Public Health Service. 107 p.

The seminar was sponsored by four agencies: the Department of Civil Engineering, Southern Methodist University, the Texas State Department of Health, Region V of the Housing and Home Finance Agency of the Federal Government; and Region VII of the U.S. Public Health Service. The aim of the seminar was to help both lay and professional people in their individual problems of environmental planning, through the experiences and thoughts of experts in the areas of housing, refuse handling, and general planning. Another objective was to exchange ideas and viewpoints between city council members, planning commission members, housing authority officials, practicing engineers, health officials, and all others interested in this vital subject.

65-0718

Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. v.p.

The proper storage, collection, and disposal of solid wastes has become of primary significance among public health authorities because of increased urbanization and the steady increase in per capita production of solid wastes. A short course covering all aspects of the problem, including planning, was included to stimulate more interest in the problems of solid wastes storage, collection, and disposal and to present avenues of approach and solutions to the problem. The Public Health Service prevailed upon the Ohio Department of Health to undertake the preparation and presentation of this subject area. With the help of a Public Health Service grant, nationally recognized authorities in the field of solid wastes and planning were obtained, and many participated in panel discussions. The table of contents includes; Definition of the Problem: Refuse Quantities and Composition; Storage and Collection - On-Site Development, and Collection Techniques; Disposal Methods - Open Dumps, Sanitary Landfills, Incineration, and Composting; Master Refuse Planning; Implementation of a Program - Current Status, Review of Legislation, Various Approaches, Financial Aspects, Political Aspects, Role of the Citizen, and HHFA and Enforcement; Role of Education and Training - Academic Education, Non-Academic Education; and

Closing - Solid Waste and Tomorrow, Current Research, and Summary.

65-0719

Refuse disposal study; regional planning study no. 42. Akron, Ohio, Tri-County Regional Planning Commission, [Oct. 1965]. 121 p.

The existing facilities in the Akron, Ohio, regions are surveyed and the needs through 1980 are projected. Refuse disposal will soon become a serious problem in many communities of the region due to the expanding urban populations, lack of proper disposal facilities and the increase in per capita refuse production. Sanitary landfill in sites acceptable to the communities is suggested as the answer to the immediate problem and through 1980. The studies and data needed for planning beyond 1980 are outlined. The following topics are covered: refuse quantities and characteristics, collection of refuse, transfer operations, refuse disposal methods, status of refuse disposal methods, status of refuse disposal in the tri-county region, recommendations for future refuse disposal, alternatives for refuse disposal, financing alternatives for refuse disposal. The appendices cover legal considerations, preliminary work and operational procedure for a proposed sanitary landfill and survey forms.

65-0720

Regional approach the best solution. American City, 80(5):44, May 1965.

Detroit found the best solution to refuse problems by combining efforts of municipalities on a region-wide basis. Disposal facilities could be publicly owned and operated. Combined collection of garbage and rubbish is more economical. Legislation is to be adopted to eliminate open dumps in Detroit area. Sanitary landfills are to be used whenever possible. Incinerators are to be considered part of the disposal program.

65-0721

Reid, P. M. Current status of implementation of solid waste plan. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.P-2 to P-10.

In the Detroit area local governmental units dispose of their refuse outside their borders, within the territory of another governmental unit. In most of the urban areas the collection and disposal of solid waste is on a make-shift basis, limiting public health and community sanitation. The strategy for developing and implementing a solid waste disposal plan must be formulated on an inter-community basis. Public awareness and understanding are essential. A committee of supervisors from 5 member counties recommended that the regional planning agency emphasize facility planning, particularly for garbage and rubbish. A project outline was developed, planning for large areas of land, and re-use of sanitary landfill areas. The purposes of the project were: to present a picture of the current practices of collection of refuse; to examine the various methods of disposal; to formulate a plan for future disposal which would insure the welfare of the region, and to recommend future uses of land. It was concluded that two methods of solid waste disposal were feasible: incineration in large-scale incinerators, with disposal of the residue ash in sanitary landfills; and sanitary landfills of raw refuse. Therefore, two plans were developed for the 5-county region. Plan I, in the core urban area, recognizes the effectiveness of three of the current district operations and leaves them on their own. Plan II adds 7 incinerators and places greater emphasis on this refuse disposal process. The use of a competent technical Advisory Committee with a Policy Body and a Citizens' Advisory Committee is recommended.

65-0722

Reid, P. M., J. Coleman, S. Overmate, et al. Panel discussion of various approaches. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.R-1 to R-26.

The collection and disposal of solid waste is an urban problem which must be initially approached from the governmental unit. The implementation of a long-range disposal program is impeded by the lack of concern of government officials in the policy-making areas, budgetary limitations, and public apathy. Long-range planning must be done on an area-wide basis and must include all the governmental units involved. Data must be developed and assistance from state legislatures must be obtained. Legislative and tax problems in Ohio are discussed. There is some possibility that Public Health Service and the HHFA may initiate joint projects in solid waste disposal planning in metropolitan areas. The air pollution of New York City is traced, citing trouble with incinerators as a part of the anti-pollution program. An ad hoc committee was formed under the Building Research Housing Authority to provide minimum standards for apartment house incinerators. At present, there is no legal provision for solid waste districts. The problem of open dumps is mentioned. The air pollution problem with gypsy asphalt plants is cited. Milwaukee is the only city in Wisconsin with a code for air pollution. In Michigan a licensing program requires garbage to be cooked before it is fed to hogs, and a solid waste licensing bill will be implemented. The activities of the Ohio Municipal League with respect to refuse disposal plans are described. The Public Health Service has a model ordinance for local municipalities which could be incorporated into a statewide law. There is a need for disseminating information.

65-0723

Robinson, C. M., G. Engle, and L. E. Crane. Summary and course closing. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.SUM-1 to SUM-5.

Political leaders must be chosen with the quality of living they desire in mind. The citizen's approach to solid waste is as negative as it was to sewage disposal years ago. Control is effected through local government and the federal government allocates the funds. Solid waste problems should be approached and solved on a self-supporting utility basis. Master planning is essential and advisory committees are helpful. Competent workers are needed. The question of states certifying workers and supervisors at solid waste facilities is raised. Individual community problems should be studied in detail as separate entities. The rapidly advancing time and changes in solid waste programming must keep pace with the changing loads, characteristics, changing attitudes, changes in design, changes in equipment, and changes in people. The solid waste program in a nutshell consists of: motivation, planning, design, construction, operation, in that order. Although foolproof incinerators and good landfills can be designed, they cannot be operated by incompetent personnel. There is a need to inspire, recruit, train, and hold personnel in solid waste organizations. Too much attention is given to minor aspects of the old solutions and not enough thinking and research is focused on entirely new concepts. There is a lack of scientific approach to cheaper and better methods. Public awareness must have professional guidance. Unity and coordination among all agencies and groups must be attained. More conferences and meetings at the regional and local levels are needed.

65-0724

Rogers, P. A. San Francisco bay area solid waste management and planning problems. California Vector Views, 12(10): 51-54, Oct. 1965.

Details of the solid waste situation in the 4 million population San Francisco Bay area are delineated by the State Public Health Department, particularly with regard to long-range planning projects. Approximately 33,125 areas of land will be needed to accommodate the disposal volume up to the year 2000. Unless preparatory measures are expanded, most counties in the Bay area will incur critical disposal problems by 1979. The department recommended to the Bay area governments an immediate investigation of new or alternate disposal methods, a regional master plan for immediate additional landfill site acquisition, investigation into refuse transfer stations, improvement of present operational practices, and investigation of possible districts to consolidate planning of disposal facilities.

65-0725

Rogus, C. A. Refuse quantities and composition. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.C-1 to C-22.

Solid wastes are commonly termed refuse, which is defined as all of the solid wastes of a community including those semi-liquid or wet wastes whose moisture content is insufficient to make the material free flowing. Refuse can be sub-classified into garbage, rubbish, ashes, and special wastes, which are defined. In addition to this communal refuse are the agricultural and canning wastes. Refuse can also be classified by its origin: domestic, municipal, commercial, and industrial. The responsibility for the collection and disposal of these wastes is not uniform and is determined by local policy, but there are general patterns. The factors influencing quantities and composition of refuse include: number and types of industries and commercial establishments and degree to which their wastes are self-disposed; climate; seasons, and income level. Tables give data about: total refuse collected in 12 U.S. cities, 1957 to 1958, monthly distribution by weight of refuse disposed of in New York City; 1939, and physical analysis of refuse by weight, Chicago 1956 to 1958. The most significant physical properties of refuse are density, moisture content, percent of combustibles, percent of putrescibles, percent of compostables, calorific values, percent of salvables, and presence of over-large materials. Special wastes include: demolition and construction wastes, out-sized wastes, synthetic wastes, radio-active wastes, and incinerator flyash and ash residues. There are notes to the table on production, collection and disposal of refuse.

65-0726

Rosenblum, H. The role of the citizen. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.U-2 to U-14.

The voice of the citizen in the matter of waste disposal is usually negative: complaints about the carelessness of garbage and trash men, grumble about litter in the streets, and, in groups, protest any incinerator, dump, or sanitary landfill in their neighborhood. Most citizens give the problem no thought at all or, if asked, say that refuse should be placed as far as possible from humna habitation. Ten years ago citizens were just as apathetic about sewage disposal plants. Active citizens worked for better schools, highways, and recreational facilities. The need for such improvements was evident and water pollution affected the town downstream. Today citizens are informed about the problems created by lack of sewage treatment. They support bond issues, press for enforcement of existing laws, and urge passage of stronger legislation. The voice of the public can be positive if the public is made aware a problem exists. Mass media can help to inform the citizen. Citizens advisory committees can be useful. It is important that: (1) facts be gotten and friends made; (2) a course of action chosen; (3) public understanding and support developed; and (4) public support expressed where the power is. Some case histories to illustrate these are given from the author's experience. (She is Director of the League of Women Voters of the United States.) One dealt with trash collection, one with a new site for a sanitary landfill.

65-0727

Schmidt-Lamberg. Coordination of sanitary planning for cities in developing countries. Staedtehygiene, 16(10):232-233, Oct. 1965.

The Sixth International Conference of the Cities of African Countries held in Ibadan in West Nigeria brought a number of important resolutions. Foremost is the general agreement to cooperate and to coordinate the planning of urban sanitation, not only nationwide, but also between the individual countries. While city cleaning is satisfactory for the downtown areas of large cities, it is necessary to include also the suburban areas in the programs. It is planned to increase the radius of the 'cleaning efficiency' by 50 km every 5 years. There is already a developing industry for street cleaning equipment. Joint ventures for the near future are pipe lines which will transport the waste into the sea. Presently a pilot project is be[illegible]uilt between Abohuta and Lagos in Nigeria. Abandoned cars begin to be a problem in many places. The twelve West African countries have to deal with 12,000 auto wrecks yearly. Some cities plan to build large incinerators. The cities of

Accra, Lagos, and Daressalam install grates for 3,200 cu m of waste per day. Some 200 to 250,000 tons per year will generate electric power and remote heating. Another aspect of the problem of hygiene in cities is the education of the population. It is as important for the battle against the increased flow of waste as modern machinery and facilities. (Text-German)

65-0728

Stead, F. M. Management of waste disposal systems. In American Public Works Association Yearbook, 1965. Chicago, American Public Works Association. p.110-114.

Although California faces crises in the fields of air pollution control and water resources, the problem of waste disposal is the most acute. There has never been a system of disposal for municipal solid wastes. Landfill, which is terminated when the available space becomes exhausted, has been the most commonly used method of disposing of municipal solid wastes. Oxidation ponds and lagoons have been used for removal of unstable organic material from a wide variety of liquid wastes. There have been breakthroughs in the removal of nitrogen, phosphorous, and other nutrients. The reclamation of a high proportion of waste waters in inland areas is planned. The organic waste is being converted to usable products. In biological conversion of organic wastes by either aerobic composting or by anaerobic digestion, both nitrogeneous and carbonaceous wastes must be utilized in proper proportion. Garbage can be combined with sewage sludge, and in agricultural areas, animal and poultry manures can be combined with carbonaceous wastes to produce compost by the aerobic process. Cellulose commodities such as tree limbs can be converted by destructive distillation processes into a carbon product with gaseous by-products. By shifting from landfill to conversion, the end products are permanently removed and assimilated. Thus, the keys to the solutions of California's waste problems consist of converting and recycling the liquid and solid wastes and of utilizing relatively wastefree sources of energy.

65-0729

Tri-County Regional Planning Commission. Refuse disposal study; regional planning study no. 42. Akron, Ohio, [Oct. 1965]. 121 p.

The existing facilities in the Akron, Ohio, region are surveyed and the needs through 1980 are projected. Refuse disposal will soon become a serious problem in many communities of the region due to the expanding urban populations, lack of proper disposal facilities, and the increase in per capita refuse production. Sanitary landfill in sites acceptable to the communities is suggested as the answer to the immediate problem and through 1980. The studies and data needed for planning beyond 1980 are outlined. The following topics are covered: refuse quantities and characteristics, collection or refuse, transfer operations, refuse disposal methods, status of refuse disposal in the tri-county region, recommendations for future refuse disposal, alternatives for refuse disposal, and financing alternatives for refuse disposal. The appendices cover legal considerations, preliminary work and operational procedure for a proposed sanitary lnadfill, and survey forms.

65-0730

Tucker, N. E. Definition of the problem. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.B-1 to B-4.

One simple cause of solid waste problems is public apathy. The mounting garbage and refuse piles are examples. Community education is necessary to change open dumps to sanitary landfills. The responsibility for solid waste disposal lies with elected political officials who traditionally avoid the issue. In university planning departments there is a dearth of theory and application of principles for the collection and disposal of solid wastes. Health departments are often complacent. The land available for disposal sites is diminishing while the volume of solid wastes is increasing because of increased population and increased amounts per capita day. Costs are rising because of: equipment, maintenance, labor, land procurement, inflationary trends, diminishing tax funds, reluctance to increase charges, and municipal bondability limitations. Solutions to the problem are: increased community education; change of political attitude or the removal of solid wastes control to a non-political entity; augmentation of planning curricula to include solid wastes and/or specialized training for practicing planners; stimulating health departments with adequate legislation, staffing, training; increased research and training in developments which result; the realization that solid wastes problems should be treated as a utility service to the consumer with the payment necessary to operate it.

65-0731
Tucker, N. E. Solid waste discussion. In Proceedings; Seminar on Regional and Municipal Environmental Planning, Dallas, Jan. 7-8, 1965. U.S. Public Health Service. p.49-50.

Of 140 million people in the United States only 100 million receive refuse collection service. Of 2,500 U.S. cities which have populations over 2,500, less than 50 percent have what is designated as approved nuisance-free refuse disposal. The solid waste problem is broken down into 4 segments: site storage, collection, disposal, and planning. The three variables in refuse handling are: vacant land, refuse production, and population. For sanitary landfill, which is the most prevalent of the accepted disposal methods, the requirement of one acre per year per 5,000 population is applied. This applies when the refuse is compacted to a depth of 10 ft. With a properly operated sanitary landfill, land can be reclaimed for many uses. Changes in the refuse industry have involved the use of containerized systems of storage by industrial and commercial establishments and the use of the refuse train system--a series of trailers pulled by a pickup truck.

65-0732
Williams, K. HHFA and ordinance enforcement. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.V-1 to V-8.

The Housing and Home Finance Agency (HHFA), created in 1947 to direct federal programs in housing and community development, operates through five constituent agencies: Federal Housing Administration, Public Housing Administration, the Federal National Mortgage Association (Fanny Mae), the Community Facilities Administration, and the Urban Renewal Administration. The purpose of the last is to provide funds for comprehensive urban planning and to give financial and technical assistance to communities undertaking urban renewal. Urban renewal programs are initiated, planned, and carried out by cities, not by the federal government. Most of the new construction and rehabilitation is done by private enterprise. The open space land program aids local or regional public bodies acquire and save open space for recreational use by grants covering up to 50 percent of the cost. Sanitary landfills may be acquired under this program provided that the sites are developed for recreational use within 40 years. Comprehensive plans and local self-improvement are necessary. More than 2,400 communities have programs certified by HHFA. These include adequate codes that provide sound standards for new construction and govern the use and occupancy of all housing units. Model codes have been developed, but local codes are acceptable. Codes are useful for enforcement, to prevent blight, and as educative devices. All these programs depend upon local citizen action. Public hearings, project area meetings, and involvement of those whose lives will be affected from the start are all important.

65-0733
Witherspoon, J. Political aspects of solid wastes. In Proceedings; Technical and Planning Aspects of Solid Wastes, Columbus, Sept. 1965. Ohio Department of Health. p.T-2 to T-7.

Solid waste disposal is essentially a local problem. Urbanization has erased the traditional relationships between city and county governments and today many large cities are trying to hand over to their counties those municipal services like waste disposal which benefit all residents of the county. The National Association of Counties (NACO) has eleven full-time professional staff members and works on such projects as the Local Official's Community Action Program in water pollution control, air pollution control, and solid waste disposal. (The author is Associate Director of Research, NACO). Growth in population is taking place in unincorporated areas which will have to provide municipal type services on a large scale with high capital expenditures. These local jurisdictions have had little experience in providing such services. Cities and urban counties will have to seek other means of disposal than the traditional means in someone else's territory. Three local political factors are important: politicians themselves; charateristics of local government; and the citizen's response to local issues. Three general types of local politician are: the single-minded office holder, the non-leader, and the performer. The first is the most dangerous. The non-leader needs pushing. Local government can be considered from the points of view of authority, structure, and age. Good citizen response to public issues is of prime importance.

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In industrial areas with high population densities the removal of waste is largely a problem of planning and organization. The task becomes vastly more complicated if political questions arise. This is the case in the area of Basel, Switzerland, where Germany, France and Switzerland meet, the latter represented by not less than five cantons. Despite these difficulties, cooperation between all parties concerned must be achieved, since only large-scale planning leads to both economical and truly satisfactory solutions. Thus the large waste incinerator of the canton Basel is supplied by waste and chemical refuse from communities even from across the borders. In densely populated areas, incineration is the preferred waste removal method, supplemented by the deposition of slag and ashes. Also, it is more economical to build one large incinerator than several small ones. Transportation costs should not be overestimated, especially if superhighways can be used. Large plants cope more easily with chemical refuse and sludges from sewage systems. Small incinerators are advantageous only if the transportation and heat distribution conditions require them. Two maps show the population densities of the area of Basel for the year 1960 and the expected densities for the year 2000. (Text-German)

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